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ABSTRACT

This study looked at New Chance, a voluntary randomized trial of an intensive program for teenage mothers and their children that operated nationally between 1989 and 1992. The study examined the effects of maternal psychosocial well being, intensity of work and educational pursuits, home environment, and use of childcare on combined experimental and control group children's cognitive and behavioral development. Favorable home environment offered protection from poor cognitive development, as did mothers earning a high school credential. Risk factors for poor cognitive development were Hispanic ethnicity and long-term welfare receipt when the mother was a child, while maternal education was protective. Extended exposure to center-based childcare was protective for cognitive development for children under age one at intake. Mothers' depression and parenting stress were associated with higher maternal reported behavior problems, while minority status and earning a high school credential predicted fewer maternal reported behavior problems. Child sex (male) was the most important risk factor for poor teacher ratings. Use of childcare did not predict behavior, except that children over two years of age using the most center-based care were at an increased risk for poor maternal ratings. These findings suggest that programs should address parenting stress and continue to support and encourage education for teenage parents. (Contains 29 tables, 2 appendixes, 2 figures, and 107 references.) (MKA)

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IMPROVING THE ODDS FOR CHILDREN OF TEEN MOTHERS: WHAT MATTERS MOST?

Cheri A. Vogel

A DISSERTATION

in

Education

Presented to the Faculties of the University of Pennsylvania in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

1999

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DEDICATION

This dissertation is dedicated to my parents, Larry and Ginny Vogel, in gratitude for instilling in me a love of learning, and to David Smallwood, without whose unfailing support, patience, love, understanding, and editorial criticism, this project would not have been completed.

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ABSTRACT

IMPROVING THE ODDS FOR CHILDREN OF TEEN MOTHERS: WHAT MATTERS MOST?

CHERI A. VOGEL

REBECCA A. MAYNARD

Adolescent motherhood has serious developmental consequences for children, with effects often lasting into adulthood. Programs to foster self-sufficiency and parenting skills in teen mothers, while bolstering the cognitive and socioemotional development of their children, have met with limited success. Further information on factors affecting child development, particularly those that can be improved programmatically, is needed. This study examined data from New Chance, a voluntary randomized trial of an intensive program for teenage mothers and their children that operated nationally between 1989 and 1992. Despite a rich array of services, New Chance had few effects on mothers or their children. This study examines the effects of maternal psychosocial well being, intensity of work and educational pursuits, home environment, and use of childcare on combined experimental and control group children's cognitive and behavioral development. Favorable home environment offered protection from poor cognitive development, as did (mothers) earning a high school credential. Risk factors for poor cognitive development were Hispanic ethnicity and long term welfare receipt when the mother was a child, while maternal education was protective. Extended exposure to center-based childcare was protective for cognitive development for children under age 1 at intake. Behavior ratings of children were supplied by mothers and by teachers. Mothers' depression and parenting stress were associated with higher maternal reported behavior problems while minority status and earning a high school credential predicted fewer maternal reported behavior problems. Child sex (male) was the most important risk factor for poor teacher ratings, followed by maternal employment, high maternal parenting stress, and child age. Maternal education was a protective factor for poor teacher ratings. Use of childcare did not predict behavior, except that children over 2 using the most center-based care were at increased risk for poor maternal ratings. It is hoped that these findings will be useful to developers of the next generation of programs. In particular, these findings suggest that programs should address parenting stress and continue to support and encourage education for teenage parents.

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CHAPTER I

INTRODUCTION AND OVERVIEW

The Issue

Adolescent motherhood is a continuing and significant social problem in the United States. Rates of adolescent pregnancy and births, despite declines for much of the 1990s, continue to be unacceptably high, particularly when compared to rates for other industrialized nations. Nearly a half million children were born to mothers aged 15 to 19 in 1997 alone (Ventura, Martin, Curtin, & Matthews, 1999). Investigators predict that the sheer numbers of children born to adolescent mothers will increase as the teenaged population continues to grow (McElroy & Moore, 1997). Teenaged childbearing is costly to society both in terms of dollars and wasted human potential. Teen mothers are less able to support themselves and often become dependent on welfare for their survival. Their children often face a host of adverse circumstances that result in a cycle of poverty and wasted potential. Consequently, many millions of dollars have been spent in the effort to curtail teen pregnancy and childbearing and to improve life chances for young women with children.

The research literature and the varied successes and failures of intervention programs have helped to highlight the complexity of the problem. Although the severity of the consequences of early childbearing for the young women are a point of debate (see Hoffman, 1998), the consequences for children born to teens are less in doubt. Compared to the children of older mothers, they are at increased risk for having a substantiated allegation of abuse or neglect (Goerge & Lee, 1997), experiencing deficits in math and reading achievement, and increased behavior problems (Moore, Morrison, & Greene, 1997). Children of teenagers continue to be at risk as they reach adolescence, with higher rates of delinquency and grade repetition (Moore et al., 1997), lower rates of high school graduation and, among girls, increased rates of teenaged childbearing (Haveman, Wolfe, & Peterson, 1997).

Evidence that children born to teens suffer a multitude of poor outcomes has spurred interest in early intervention in their lives. Yet, there is still much to be learned about how teen motherhood affects their children. This research looks at the social and intellectual development of the children born to teenagers in an effort to shed light on which aspects of their mothers' backgrounds and experiences are most important in shaping their children's early lives. The following sections review the literature on teen mothers and their children's developmental and behavioral outcomes. A subsequent section describes the state of knowledge on the impact of non-maternal childcare, as this has been one of the primary pathways for interventions to improve outcomes for children. Following this is a brief discussion of other programs directed at adolescent mothers, and a more detailed review of the New Chance program and its efficacy.

This dissertation addresses the following questions with the expectation that the answers will inform future efforts to improve outcomes for teenage parents and their children:

(a) What factors were the best predictors of adverse developmental outcomes in this sample of children born to teenage mothers, and,

(b) Does the use of non-maternal childcare affect child development in predictable ways?

Teenaged Mothers and Their Children

Young women who give birth as teenagers have poorer outcomes, both for their own lives and for the lives of their children, than do women who delay childbearing. Poverty, low educational attainment, single parenthood, and other sociodemographic factors not directly related to the birth, mediate the relationship between maternal age at the time her first child is born and child outcomes (e.g., Kinard, 1990; Maynard, 1995). The intergenerational effects of poverty are evident in this population, as many teen mothers come from families with low socioeconomic status (SES) (McElroy & Moore, 1997). Other factors affecting poverty status are more likely to be directly related to the early childbirth itself, such as low educational attainment, single parenthood, additional births, and welfare receipt. Teen mothers have high probabilities of dropping out of school, putting them at a distinct disadvantage in the job market (Furstenberg, Brooks-Gunn, & Chase-Lansdale, 1989; see literature reviews by Klerman, 1991, and Luster & Mittelstaedt, 1993). Teen mothers are also likely to be single at the time of pregnancy and childbirth and to receive little or no financial support from the fathers of their children (McElroy & Moore, 1997). Further, teen mothers are much less likely to marry after the birth of their child, and thus spend a large proportion of their child-rearing years as single parents (Hotz, McElroy, & Sanders, 1997; McElroy & Moore, 1997). They are also likely to have additional (most often unplanned) children, with less spacing between births than women who delay childbearing (U.S. General Accounting Office, 1994, Luster & Mittelstaedt, 1993; Maynard, 1995). Because they often lack credentials or marketable skills, teen mothers frequently rely on welfare for their economic survival. At any point in time, roughly half of all welfare recipients are current or former teenaged mothers (U.S. General Accounting Office, 1994; in Maynard, 1995).

These differences between teenaged and older mothers have all been shown to predict poor child outcomes. For instance, maternal education is used as a control variable in most studies because of its strong impact on child development. Children's academic performance also has been shown to be impacted by family poverty (Haveman, Wolfe, & Spaulding, 1991; Zill, Moore, Smith, Stief, & Coiro, 1995) and by living in a single parent household (Aquilino, 1996), both common among teen mothers. Moreover, children of teen mothers often have less adaptive behavioral development. Poor behavioral outcomes are especially prevalent among children of teen mothers if the mothers are unemployed and if they are receiving welfare (Kinard, 1990).

The question is to what extent are these negative outcomes caused by having a teenaged mother specifically, versus simply correlates of being born to a teen mother. In effect, the question is: what is the mechanism through which especially poor outcomes are transmitted to children of teenaged mothers? What causes some people to be better parents than others? One arguably important mediating factor is parenting skill. Belsky (1984) has articulated a model of the determinants of parenting that includes such factors as maternal characteristics (e.g., personality, maturity, and other psychological variables), social supports, and child characteristics. According to Belsky's model, these factors are interdependent determinants of parenting. Teenaged parents, by their very nature, are quite likely to be low in maturity.

Since adolescent mothers themselves are in a difficult developmental stage, they may lack the emotional and psychological maturity to be good parents, and many have had little exposure to effective parenting models. Belsky's model posits that, to the extent that there are deficits in maternal characteristics, the other factors become more critical to effective parenting—particularly social support. Lacking maturity and adequate social supports, teenaged mothers tend to adopt less effective parenting styles than do older mothers (Belsky, 1984; Furstenberg, et al. 1989).

Researchers also have found that teen mothers of preterm infants lack knowledge of appropriate developmental milestones (Field, 1980). This is consistent with the findings of others who have found that maternal knowledge of child development affects the quality of the home environment (Benasich & Brooks-Gunn, 1996). Further, others have found that teen mothers provide less stimulating home environments for their children than older mothers do (Moore et al., 1997). Whiteside-Mansell, Pope, and Bradley (1996) found five distinct parenting styles in their study of young mothers of low birth weight (LBW) infants. On average, younger mothers (aged 15-24 years) scored lower on a measure of home environment (a measure of parenting) than older mothers. In addition, young mothers, particularly those with low IQs, were found to adopt less favorable parenting styles, which were related to poorer child development. Having additional children acted as a discriminating factor among parenting styles of young mothers with low IQs, with least favorable parenting styles being most common among those having had the largest number of children (Whiteside-Mansell et al., 1996).

This dissertation examined, among other things, the relative effects of maternal characteristics and parenting on children's developmental outcomes. The following section summarizes findings on the developmental outcomes of children born to teenaged mothers.

Children of teenaged mothers have been shown to experience a variety of negative developmental outcomes, particularly in the area of cognitive development. Researchers have found that some children experience delays even in infancy, in part due to their increased risk of low birth weight and other health problems (see Luster & Mittelstaedt, 1993 for a review). Others have found that delays continue into early childhood, with the children of teen mothers scoring lower on commonly used indices of school achievement (Moore et al., 1997). Early delays are compounded when the child reaches school age. School-aged children of teens have been found to score lower on measures of school achievement than their counterparts (Aber, Brooks-Gunn, & Maynard, 1995). Not surprisingly, many of the negative effects including lower graduation rates and lower literacy levels (Baydar, Brooks-Gunn, & Furstenberg, 1993) and higher rates of teenage pregnancy among female children (Brooks-Gunn & Furstenberg, 1986) last into adolescence and young adulthood.

There is also evidence that the children of teen mothers exhibit increased behavior problems. This is indicated by maternal reports. In a number of studies, teen mothers rated their children's behavior as being more problematic than did older mothers. Researchers have found differences in the incidence of maternal reports of behavior problems in infancy (Brooks-Gunn & Furstenberg, 1986), early childhood (Moore et al., 1997), and young adulthood (Baydar et al., 1993). Of course, an alternative interpretation of the higher incidence of maternal reports of behavior problems among their children could be that the younger mothers, lacking knowledge of normative child behavior, distort their reports. In a study that gives some support to using maternal ratings, Zaslow et al. (1995) compared the power of maternal and observer ratings of the mother-child relationship to predict measures of the children's verbal ability and maturity. Although there was only a modest relationship between the two sources of ratings, each significantly predicted child outcomes. More objective evidence for increased behavioral problems has also been found. Grogger (1997) attempted to estimate the relationship between early childbearing and later arrest and imprisonment of male children. His simulations showed that delaying childbearing just until 18 years of age reduced the risk of later incarceration of male children by 6%. Longer delays were associated with even larger reductions in risk.

There may be reciprocal relationships between cognitive and behavioral problems. For example, starting school with poor cognitive skills may compound the disadvantages associated with poorly controlled behaviors (Kinard, 1990), thereby further compromising learning. It also is likely that both developmental delays and behavior problems share some common determinants. In either case, behavioral problems early in life can set the stage for more serious difficulties in adolescence and young adulthood. For instance, past misbehavior in school was a risk factor for later in-school misbehavior of 12th graders in the National Educational Longitudinal Study of 1988 (Giancola, 1998). What is less clear is the extent to which these effects are due to factors associated with teenaged parenthood (e.g., poverty, single parent households, and low educational attainment) as opposed to differences in parenting behaviors. One aim of this project is to explore the interplay of among these factors.

Trends in Daycare Usage

Childcare is a substitute, and at times a complement, to parental care. Although maternal care and the home environment still tend to be the single most important sources of influence on children's development, increasing numbers of children are spending substantial amounts of time in non-parental childcare (U.S. General Accounting Office, 1998a), making childcare settings potentially important influences as well.

Ninety percent of children living in families earning less than the poverty level whose mothers were employed had spent time in child care (U.S. Bureau of the Census, 1998). Statistics from the U.S. Census indicated low income families differ from higher income families in their patterns of childcare usage. Compared to all preschoolers with employed mothers, preschoolers living below the poverty line are more likely to be cared for by relatives either in the child's home or the providers (52.3% vs. 43.8%), and somewhat less likely to use daycare centers (17.3% vs. 21.6%), non-relative babysitters (14.5% vs. 20.5%), or school-related arrangements (6.3% vs. 8.9%) (U.S. Bureau of the Census, 1998). The time spent in care by low income children is more difficult to gauge. However, some light is shed by the National Institute of Child Health and Human Development's (NICHD) longitudinal study of childcare patterns of more than 1,000 families with newborn children. In this study, just under half of the children in families with income-to-needs ratios below one (values below one indicate the family takes in less money than it needs to live) were in regular non-maternal childcare (NICHD Early Child Care Research Network, 1997). Of those in non-parental care, they spent an average of 33 hours per week there.

The overall trend in increasing childcare usage is due in part to several demographic shifts that have resulted in increasing numbers of women entering the labor force (see Hernandez, 1995, for a review). The precipitous rise in the divorce rate, which has more than doubled since 1960, and the rise in non-marital childbearing have worked together to increase the number of single mothers (U.S. Department of Health and Human Services, 1995), many of whom require daycare for their children. Recent changes in welfare law will further increase the demand for childcare among low income families, particularly single parents. In 1988, the Job Opportunities and Basic Skills (JOBS) program encouraged states to require young mothers lacking a diploma to participate in education or training. Later, the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (P.L. 104-193) replaced the longstanding Aid for

Families with Dependent Children (AFDC) program with Temporary Aid for Needy Families (TANF). The act placed a 2-year limit on cash assistance for those not employed and a 5-year lifetime limit on cash assistance benefits. For unmarried minor teenaged parents, there were additional requirements that they must live under adult supervision and attend schooling (for those lacking a high school diploma). These legislative changes are still being implemented and their effects are only beginning to be gauged. However, national welfare caseloads have declined by 32% since reforms were instituted in 1996, with 1.4 million fewer families and 3.8 million fewer individuals receiving cash assistance today (U.S. Department of Health and Human Services, 1998). A recent report by the General Accounting Office on seven states' experiences with welfare reform indicated that between 63 and 87% of former welfare recipients nationally have become employed since reforms were instituted (U.S. General Accounting Office, 1999). The General Accounting Office (1998b) also reported recently that states have experienced increased demands for subsidized care as a result of welfare reforms.

Daycare Quality and Developmental Outcomes

There is an extensive literature suggesting ways in which daycare may benefit or impede child development. Many researchers have concluded that high quality daycare is beneficial to children's cognitive, behavioral, and social skills (Helburn & Howes, 1996; Peisner-Feinberg, 1995; see Boocock (1995) for a review of evidence from other countries). However, the effects of childcare may vary depending on both the backgrounds of the children served and the quality of the childcare. This review will include information from early childhood programs that are focused on education and enrichment as well as center-based and family daycare. As Fink (1995) argues, the differences between primarily custodial childcare and preschool programs have become less distinct. Childcare that meets high quality standards generally would not differ greatly in practice from educationally focused preschool programs. The review will examine the effects of childcare on child development (with a particular focus on poor children), the role of childcare quality, and the effects of timing of entry into care.

Childcare can be primarily compensatory/enriching, custodial, or both. Within these broad categories are a number of different types of daycare, including center-based facilities, family daycare, and relative care. Center-based care usually refers to nurseries, preschool, or Head Start programs. Licensing requirements for center-based facilities can vary greatly by state, but nearly all are regulated in some way (Hofferth, 1996).[1] Family daycare generally refers to childcare provided in the caregivers' home. The majority of family daycare providers are not licensed or regulated insofar as most states regulate only providers with more than a minimum number of children in care. Hofferth's (1996) review of childcare in the U.S. noted that there are more unregulated family daycare homes than regulated ones. In Pennsylvania for example, family daycare regulations only apply to providers who care for more than three unrelated children (PA Code: Title 55).

However, even when states regulate daycare, mere licensing requirements do not ensure quality. Few states require daycare arrangements to meet National Association for the Education of Young Children (NAEYC) guidelines for caregiver education or caregiver/child ratios (U.S. General Accounting Office, 1998a). Thus, even daycare providers following state regulations may not offer high quality care. In addition, there is a great variability in the strictness of enforcement of regulations across state. Hofferth (1996) reported that 27 states required site inspections less than once per year. Locally, the Pennsylvania House of Representatives recently pulled a bill from consideration that would have required mandatory, unannounced inspections of daycare facilities (Singer, 1999).

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[1] The exceptions are church-sponsored centers.

Most studies of children from families living in poverty (either low-income or welfare-receiving) show that they benefit from exposure to compensatory childcare. Head Start, launched in the 1960s, is the most widely implemented program for poor children in the U.S. (Lee, Brooks-Gunn, & Schnur, 1988). Evaluations of Head Start have generally found benefits in the short term, although they frequently "fade out" over time. A non-randomized study of Head Start outcomes after 1 year of participation showed that children in Head Start gained more than children in either no preschool or in other types of preschool (Lee et al., 1988). However, the Head Start group was much more disadvantaged at the outset than the other two groups. Moreover, within the Head Start group, effects seemed to be concentrated among Black children, particularly those scoring lowest on initial cognitive ability measures. Because entry into Head Start was not random, but influenced by factors indicative of disadvantage (such as poverty, low test scores, and single parent household), positive results may have been due to regression toward the mean (Lee et al., 1988). Similarly, a meta-analytic study of Head Start research, (McKey et al., 1985) concluded that the greatest effects on cognitive and socioemotional development were found immediately after participation. McKey and colleagues report a large effect size for a treatment vs. control "global" cognitive score (combined effects on intelligence and achievement) of .52 immediately after participation. However, the differences between participants and non-participants dissipated rapidly within approximately 1 year following completion of the program and disappeared altogether by 3 years post treatment (McKey et al., 1985).

In Currie's (1996) summary of the effects of government programs on children, she noted consistent evidence of immediate Head Start benefits, but that fade-out differs along racial lines. Specifically, White children tend to maintain gains while Black children do not, a fact thought to be related to the quality of schools the children subsequently attend. That is, Black Head Start children attend poorer quality schools than other Black children, while White Head Start children do not. This hypothesis was supported by the Currie and Thomas study comparing Black Head Start attendees to Black non-attendees within schools and found no differences in achievement (as cited in Currie, 1996). These findings suggest the possibility that gains could be maintained if subsequent schooling was of sufficiently high quality. Weak parenting or home environments could be other factors that influence fade-out in Head Start children.

Evidence for both the immediate and long term benefits of an enrichment program was found in the High/Scope Perry Preschool project, a randomized field test of an intensive preschool program for disadvantaged children (Schweinhart & Weikart, 1989). Results showed that in the first 2 years following intervention, children in the treatment group had higher IQs than controls. While the IQ differences dissipated, substantive differences in grade point averages, high school graduation rates, employment, and numbers of arrests remained when the subjects were 28 years old (Schweinhart & Weikart, 1989). While questions of generalizability remain due to the small, unrepresentative sample and the unique nature of the intervention (Currie, 1996), use of random assignment removes questions of effects due to selection bias.

The quality of childcare is of considerable importance when attempting to draw conclusions about the effects of childcare on child development. There is evidence suggesting that among impoverished children, even those from the poorest quality homes can benefit from formal daycare. For instance, a study of the quality of both Head Start classrooms and home environments found that children benefited from high quality classrooms no matter what the quality of their home environment (Bryant, Burchinal, Lau, & Sparkling, 1994). However, those in better quality home environments benefited more from high quality classrooms for some outcomes (e.g., problem solving and reasoning) than children from lower quality homes. In the Cost, Quality, and Child Outcomes study (Peisner-Feinberg, 1995), children in high-quality center-based daycare settings earned more favorable scores on measures of receptive vocabulary, pre-academic skills, and social behavior, even after controlling for family background.

There also is evidence that disadvantaged children may not require highly specialized interventions or the highest quality arrangements in order to benefit from childcare. Simply being exposed to organized childcare may be valuable. In a study of children from AFDC-receiving families who were either in no childcare or a "formal"[2] arrangement, use of childcare was significantly and positively related to measures of school readiness (Zaslow, Oldham, Moore, & Magenheim, 1997). However, there was some question of selection bias in the results. Even within this sample of AFDC-receiving families, those choosing to use childcare in the Zaslow et al. (1997) study tended to have the most favorable characteristics in terms of home environment, mothers' educational attainment, and literacy scores.

In a randomized field experiment, Burchinal, Lee, and Ramey (1989) examined the impact of daycare quality on low SES children's IQs and found that children in high quality care scored higher than those in the control group. Further, Burchinal et al. (1989) divided the control group into those children whose parents had placed them in community-based daycare versus those who received little or no daycare. Community-based care was likely of lower quality than the intervention childcare. Yet, control group children who had received at least some daycare outperformed those in the no daycare group, although they performed worse than those in the treatment group did. Since random assignment was used, background characteristics should not have played a role in

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[2] Formal daycare arrangements were defined as preschool, nursery school, before/after school, or center-based programs.

the treatment-control group differences, although they probably played a role in the difference between segments of the control group. The daycare-using segment of the control group had on average, more favorable home environments, mothers with higher IQs, and more education than the no daycare group.

These studies provide evidence that care need not be of extraordinarily high quality to produce benefits, although higher quality care tends to convey higher benefits. It may be that disadvantaged children have the most to gain from exposure to organized childcare. This is encouraging because numerous studies have shown that mediocre to poor quality childcare is commonplace in the U.S. (e.g., Kagan, Clifford, Helburn, & the Research Team, 1995; Kontos, Howes, Shinn, & Galinsky, 1994). There are many possible reasons for the abundance of mediocre to poor quality daycare arrangements, ranging from parents valuing convenience over quality (Helburn, Culkin, Morris, & Clifford, 1995), to lax state licensing practices, discussed earlier (Hofferth, 1996).

In the Cost, Quality, and Child Outcomes study, researchers rated 400 center-based facilities in four states (Kagan et al., 1995). Findings indicated that very few daycare centers provided the highest quality care, with only 14% of all surveyed center-based facilities rated as high quality. Infant and toddler classrooms scored worst, with only 8% rated as developmentally appropriate (Kagan et al., 1995). Even Head Start has been plagued with assertions that the quality of the program is inconsistent (Bryant et al., 1994; DeParle, 1993). Others have found that family daycare is often of even lower quality than center-based care (Kontos et al., 1994; Weinraub, 1997). If family daycare tends to be of lower quality than center-based care on average, this may be the reason that center-based care seems to benefit children from low-income families more (but see Baydar & Brooks-Gunn, 1991).

Quality issues aside, the timing of daycare may also affect children. Although study results have been inconsistent, some have found that use of childcare within the first year of life is harmful to children because it interferes with mother-infant attachment (Vojobeda, 1997), or with cognitive and behavioral development (Baydar & Brooks-Gunn, 1991). Others found that regular childcare within the first year of life was beneficial for children from low income families (Caughy, DiPietro, & Strobino, 1994). It is possible that differences in the impact of the timing of entry into care have more to do with the relative quality of parent care versus non-parental care. The effects of starting regular childcare before 1 year of age is one of the issues that investigated in this dissertation.

Efforts to Mitigate the Adverse Consequences of Teen Childbirth for Mothers and Their Children

A number of research and demonstration projects have attempted to ameliorate poor life course outcomes for teenaged mothers. Most were single-generation programs that were mainly concerned with helping teenage mothers attain self-sufficiency though education and job skills training (e.g., Wisconsin's Learnfare, the Teen Parent Demonstration Program, and JOBSTART, among others). These programs generally operated on a large scale and, in several, participation was mandatory (for reviews see

Boruch, 1998, and Maynard, 1995).

In most cases, small impacts on the teenaged mothers were found. For example, a number of programs have been successful in helping participants complete the General Education Development (GED) certificate, but generally programs have been less successful in delaying further childbearing (Aber et al., 1995; Maynard, 1995), or substantially improving the economic status of participants (Boruch, 1998). Regardless, some have suggested that there may have been indirect impacts of single generation programs on children mainly through changes in childcare usage (Zaslow, Moore, Coiro, & Morrison, 1994).

Other programs took on a two generation focus (St. Pierre, Layzer, & Barnes, 1995). Two-generation programs generally provide education, job skills training, and parenting courses to the young mothers in concert with separate, developmentally appropriate services for their children (St. Pierre et al., 1995). Most commonly, two-generation interventions have been provided in the community. Participants are responsible for coming to scheduled classes, and often childcare is provided on-site. While some such programs have been successful in improving parenting skills and GED attainment among the mothers, there often has been no concomitant improvement in maternal literacy or household income (St. Pierre et al., 1995). Child development has tended to be impacted little or not at all in a number of such programs that have been rigorously evaluated, including New Chance. The most intensive program studied, the Infant Health and Development Program, showed the largest effects on children's cognitive development, leading St. Pierre and colleagues to conclude that program intensity may be an important determinant of effectiveness.

In another intervention model, termed home visitation, young women are visited individually in their homes by an outreach worker (worker qualifications can range from nurses and social workers to lay staff). Evidence for the impact of home visitation is also mixed. In a comprehensive review of randomized home visitation experiments, Olds and Kitzman (1993) noted that impacts differed depending on the outcome measured, the population targeted, and the nature of the home visitor service program. There were few reported impacts on targeted health outcomes (e.g., gestational length, birth weight, mode of delivery, or use of prenatal care), and the effects on caregiving, infant mental development, and children's physical health were mixed. Although the bulk of the interventions aimed at high-risk groups found null effects of home visitation, a few studies showed promising results. Several programs serving mainly Black, unmarried teen mothers showed positive impacts on mother-child interaction, infant mental and motor development, and physical health (Olds & Kitzman, 1993). Recent evidence also suggests that home visitation can have long term benefits for children. Olds et al. (1998) report positive effects of home visitation in lessening children's antisocial and criminal activities 15 years after the (randomized) intervention, although conclusions are based on a relatively small sample of 151 children born to teen mothers who participated in the follow-up.

The New Chance Demonstration Project

New Chance was a large-scale two-generation demonstration project that showed no benefits in terms of children's outcomes. It was designed and evaluated by Manpower Demonstration Research Corporation (MDRC) (Quint, Bos, & Polit, 1997). New Chance programs operated in 16 sites across the U.S. between 1989 and 1992 (see Quint et al., for a full description). The program was intended to implement intensive services to women between the ages of 16 and 22, who had first given birth as teens, lacked a high school credential, received AFDC, and were not pregnant upon enrollment. There was some flexibility in these eligibility criteria insofar as the education and AFDC receipt requirements were waived for up to 25% of the applicants at each site. For example, those having a high school diploma but with a reading level at ninth grade or below or those who were poor but not currently receiving AFDC were allowed to apply. Moreover, a small number of participants were later discovered to have been pregnant at enrollment (Quint et al., 1997). Proof of (non) pregnancy was not required of applicants. Subjects were recruited by each site through a variety of means, such as referrals via local welfare departments, open houses, recruitment of friends by current participants, mass mailings, and other advertising (Quint, Fink, & Rowser, 1991). The resulting sample was large (N = 2,322), but neither nationally nor locally representative.

After potential participants were recruited, the program was explained to participants, including the fact that only some applicants would be included in the experimental (treatment) group. Eligible applicants were randomly assigned, with 2/3 going into the experimental group and 1/3 into the control group. Prior to random assignment, each applicant completed a Basic Information Form, which asked about her family background, educational attainment, living arrangements, number of children, and other demographic information. Each also took the Test of Adult Basic Education (TABE) reading component, and the Center for Epidemiological Studies-Depression (CES-D) scale. After random assignment, women in the control group were given lists of community resources that provided services similar to those offered by New Chance. They received no other intervention but were contacted to complete follow-up interviews roughly 18 and 42 months after application (referred to here as first and second follow-ups, respectively). Enrollment began in August, 1989 continuing through July 1991. All second follow-up interviews were completed by April 1995 (Quint et al., 1997).

The program was developed in consultation with numerous professionals and service providers to target deficits and build skills (Quint et al., 1991). There were two phases of program participation, which was designed to be intensive and to last up to 18 months. Phase I included a several day long orientation followed by a pre-employment service component. Phase I consisted of classes, usually held 5 days per week for 6 hours daily. The curricula covered two primary areas: education (including pre-employment training) and personal and child development. The focus of the education component was helping participants to improve their academic skills and, if possible, to earn their GEDs. The pre-employment component was designed to educate participants about potential careers and to teach skills needed to hold a job. Personal development focused on teaching survival skills, parenting skills, and family planning, and related topics. Enrollees also received case management services, which were meant to undergird the various program components. Attendance was nominally required (the program was voluntary), but was inconsistent in many sites. The time a participant spent in Phase I varied. Some participants were academically ready to begin GED preparation immediately, while others needed remediation in adult basic education first. After the GED was earned, or after 5 months of participation, enrollees were to move to Phase II.

Phase II incorporated employment preparation skills training, including opportunities for work internships and job placement services. These services were most often provided in the community (Quint et al., 1991).

Throughout the intervention, participants' children had access to health services and daycare. Twelve of sixteen sites offered on-site childcare. Although in two sites, care was only for temporary or emergency use, in ten of the sites with full-service on-site care, services were designed to improve children's development through provision of high quality, developmentally appropriate care. A study examining the quality of care provided in New Chance found that it generally was of good, but not excellent quality (Fink, 1995). In the Fink study, 11 daycare centers affiliated with 8 program sites were assessed for adherence to NAEYC staff/child ratios, group sizes, and staff training and education. In addition, staff turnover, benefits, and incentives were examined, as these often predict service quality. These characteristics were compared to two samples of centers serving similar populations from two separate studies: the Profile of Child Care

Settings (PCS; Kisker, Hofferth, Phillips & Farquar, 1991), and the National Child Care Staffing Survey (NCCSS; Whitebook, Howes, & Phillips, 1990). The PCS sample was nationally representative including over 2,000 centers, while the NCCSS included information on a sample of 227 centers across five cities (Fink, 1995). Results indicated that New Chance care did not meet the highest standards of quality, but was often better than that found for comparable populations (Fink, 1995).

Members of both the experimental and control groups were contacted roughly 18 months and 42 months after random assignment. The actual range of time for completed interviews was 17–29 months for the first follow-up and 30–66 months for the second. At the first follow-up, data on program participation and other outcomes of interest (such as family income, use of childcare, fertility-related behaviors, and mother's psychological well being, among others) was collected. The same data was collected at the second follow-up in addition to all data on child outcomes. Child outcomes in New Chance were measured in cognitive and behavioral domains. Table 1 summarizes the psychometric properties of the instruments used to measure child outcomes. For detailed information on each outcome measure, see Appendix A.

Response rates were high, with 89.9% of the full sample participating at the first follow-up and 89.5% of the full sample participating at the second follow-up (Quint et al, 1997). Rates within the treatment and control groups were also quite good, with 90.7% of the treatment group participating at the first follow-up, and 91.3% participating at the second follow-up. Eighty-eight percent of control group members participated in

Table 1

Properties of Child Outcome Measures Used in New Chance

	Test properties	
Instrument	Reliability	Validity
Behavior Problems Index (BPI)	• Internal consistency =.89 - .90 for preschool & school-aged in NLSY. • In New Chance, total score internal consistency =.82 and .86 for preschool and school-aged children respectively.	• Correlations between mother and teacher ratings were significant but low (r = .30). • BPI sores for children who had tantrums during interview were higher.
School Readiness Component of the Bracken Basic Concept Scale (BBCS)	• Internal consistency = .98 in New Chance sample. • In standardization sample test retest reliability (14 days) = .97.	• SRC correlated r = .77 with WPPSI-R in a validity study.[a] • In New Chance, teacher ratings of academic performance were significantly related to SRC scores r = -.30.

Note. BPI values are for mother-rated instruments. The source for all tabled values except that denoted with [a] was Polit (1996).

[a] WPPSI-R is the Wechsler Preschool and Primary Scale of Intelligence-Revised. The source of this value was Laughlin (1995).

the first follow-up and 89.2% did so at the second follow-up (Quint et al, 1997). Data collectors attempted to conduct the surveys during a home visit, although in a small number of cases it had to be done during a telephone call (11% of the second follow-up sample; Quint et al., 1997).

Impacts of the New Chance Project

Overall, New Chance had modest impacts for the mothers (Quint et al., 1997). Participation led to higher levels of GED attainment, but at the expense of regular high school education. Control group members were more likely than experimental group members to earn a high school diploma, arguably the more valuable credential. There was no programmatic impact on subsequent fertility, income, employment, or welfare receipt. Moreover, in some cases, the experimental group had poorer outcomes than the control group, for example, reporting more depression and higher levels of stress at the second follow-up (Quint et al., 1997).

There were also few positive impacts on children in the experimental group. Children were meant to be affected directly through provision of quality childcare as well as through parenting classes for the mothers. Increased use of care was thought to improve child outcomes, although increased changes in child care arrangements was thought to hinder development of positive caregiver/child attachment (Quint et al., 1997). Program participants indeed differed in their use of daycare during the early months after sample enrollment. Experimental group members were significantly more likely than controls to use any type of childcare, a daycare center, or a preschool by the first follow-up. However, use of daycare among both groups was high compared to findings from other teen parent programs, and between group differences in usage had disappeared by the second follow-up (Quint et al. 1997). Because experimental children started earlier in daycare, they continued to exceed the control children in the amount of time spent in childcare. However, by the first follow-up experimental children also experienced more childcare arrangements than control children.

Children in the treatment group did not perform better than the control group on the measure of school readiness (BBCS), and were rated by their mothers (but not by their teachers) as having significantly more behavior problems (Quint et al., 1997).

Quint et al. (1997) suggest a number of possible explanations as to why the New Chance program was not more effective. First, lack of impact on the mothers was possibly due to insufficient program intensity. Many experimental group participants had spotty attendance and received only slightly more hours of intervention than control group women were able to seek out themselves in the community. In addition, the program was voluntary and many sites were reluctant to terminate non-compliant participants (Quint et al., 1991). However, others have found that even mandatory programs have had similar difficulties with program attendance although clear expectations of participation and financial consequences of nonparticipation can work to encourage attendance (Boruch, 1998; Maynard, 1995). High levels of depression in experimental group mothers could have been the result of unfulfilled expectations for programmatic effects.

The null impact on children's school readiness may have been the result of receiving good, but not excellent, quality daycare (see Fink, 1995). Experimental and control mothers differed in their usage of formal, center-based daycare at the first follow-up, with more control mothers using informal care compared to experimental mothers. The quality of each child's placement was not assessed, although Fink (1995) found that the childcare offered to experimental mothers was of lower than the excellent quality intended by the program developers. The experimental and control groups did not differ in their scores on the home environment measure.

The negative impact on mother' ratings of their children's behavior could have been the result of increased daycare usage interfering with mother-child attachment, especially among depressed mothers. Subsequent analyses using only non-depressed mothers showed no detrimental impact of daycare. It also could have been the results of mothers becoming more aware of normative behavior. Further analysis using two-stage least squares regression showed that maternal depression was associated with more reported behavior problems of children. It was not apparent if maternal depression affected child behavior, perhaps through less effective parenting, if the depressed mother simply distorted her child's behavior in her report, if maternal depression otherwise predisposed their offspring to increased behavioral problems, or some combination of factors. Previous investigators have found independent support for depressed mothers' elevated ratings of child behavior problems (see Richters, 1992; Richters & Pellegrini, 1989), however, others have found that depressed mothers tend to over report behavior problems in their children (e.g., Fergusson, Lynskey, & Harwood, 1993).

Rationale for the Dissertation

At present, analyses of the New Chance data have concentrated on determination of programmatic impacts on the experimental group. These data have not been used to predict influences on children's school readiness and behavioral development directly. Of principal importance in this project was the exploration of the relationships between indicators of maternal competencies, the quality of the home environment, and use of childcare on child outcomes.

These analyses will identify developmental risk and protective factors for children already at high risk for adverse developmental outcomes. This is important because it adds to our understanding of developmental processes within a disadvantaged sample and can aid developers of the next generation of programs for such populations. In addition, information on the effects of timing and duration of daycare on children's development is needed in the era of welfare reform.

CHAPTER 2

THE CONCEPTUAL MODEL

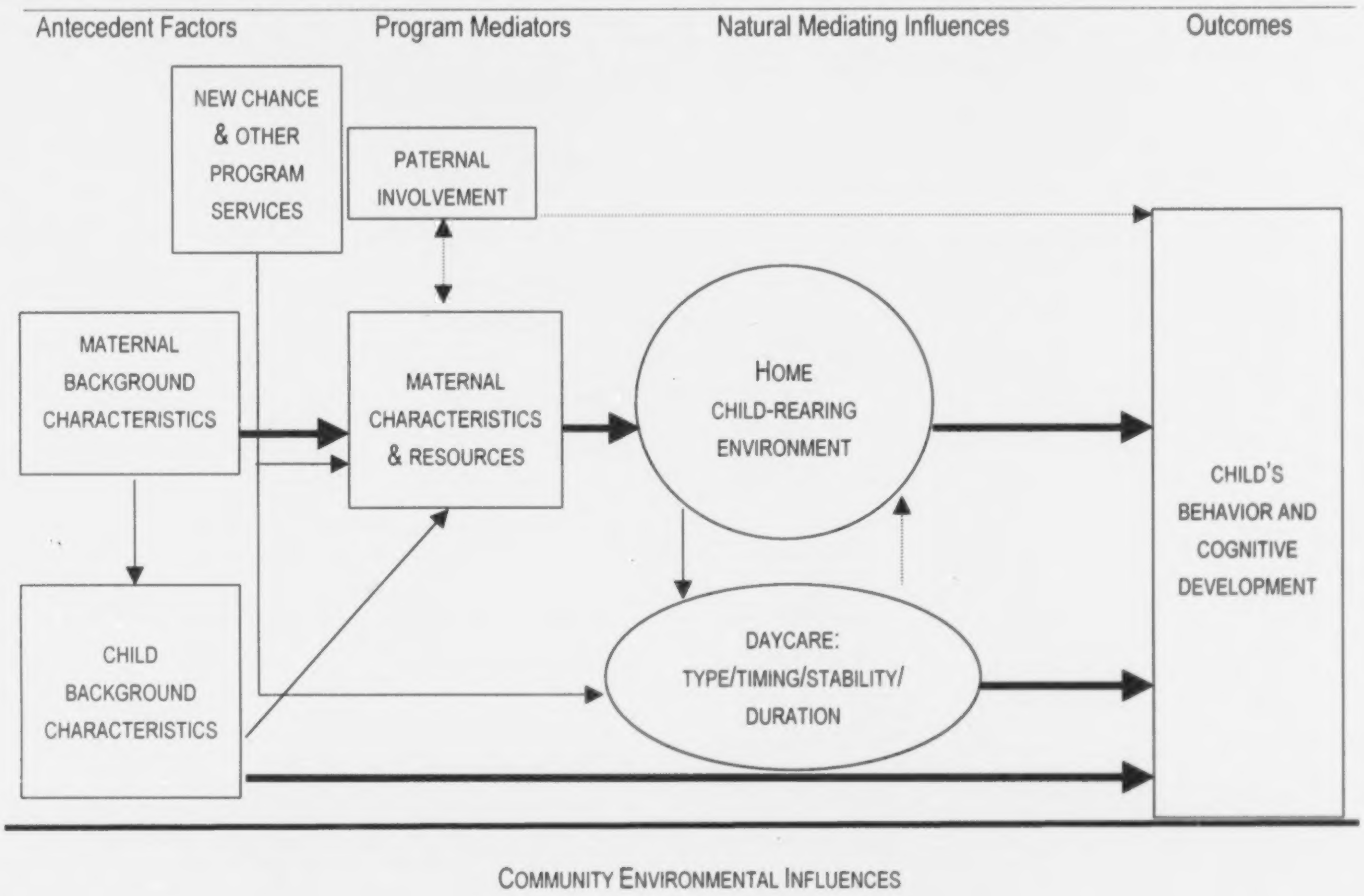
It is useful to establish a conceptual framework that organizes various influences and describes how they might operate to impact children. This framework guided the selection of variables used in the analyses that follow in Chapter 3. The conceptual model described here (Figure 1) bears some similarities to more generic models developed by prior researchers (e.g., Quint et al., 1997; Sugland, Zaslow, & Nord, 1993; Zaslow et al., 1994), although it both substantially expands upon these earlier models and is more tailored to the circumstances facing children in teenage parent headed households. Bold lines indicate relationships emphasized in this project.

Antecedents

Background characteristics of the mother are important and used as control variables. Immutable maternal background characteristics include maternal age at first childbirth, education, history of family welfare receipt, depression, and racial/ethnic origins, among others. These are represented on the far left of figure 1 and are, in part, the characteristics that made women eligible for participation in New Chance.

Child background characteristics relate to numerous attributes including but not limited to birth weight, sex, and birth order. Developmental researchers have found that male children of teen mothers are at increased risk for both problems with academic achievement and behavior (Moore et al., 1997). The evidence for effects of birth order is mixed. Some have found that firstborn children are at increased risk for poor

Figure 1. Conceptual Model for Examining Determinants of Outcomes for Children in Teenage Parent Headed Families


Antecedent Factors
Program Mediators
Natural Mediating Influences
Outcomes
NEW CHANCE & OTHER PROGRAM SERVICES
PATERNAL INVOLVEMENT
MATERNAL BACKGROUND CHARACTERISTICS
MATERNAL CHARACTERISTICS & RESOURCES
HOME CHILD-REARING ENVIRONMENT
CHILD'S BEHAVIOR AND COGNITIVE DEVELOPMENT
CHILD BACKGROUND CHARACTERISTICS
DAYCARE: TYPE/TIMING/STABILITY/ DURATION
COMMUNITY ENVIRONMENTAL INFLUENCES

development (e.g., Kinard, 1990), while others have found no differences between first borns and their later born siblings (Moore et al., 1997). Unobserved genetic characteristics as well as prenatal health and temperament would also be included in this category, although they could not be measured by New Chance.

The model suggests that maternal background characteristics influence child background characteristics. Any number of maternal behaviors (e.g., smoking) in addition to maternal health and nutrition, can influence children's birth weights. In turn, child background characteristics are expected to impact child development both directly and through maternal characteristics and resources. Obviously, some child characteristics are more susceptible to influence by maternal characteristics than others, but children can, in turn, influence their parents (e.g., children with hyperactivity tend to have parents who report higher stress than those without; Mash & Johnston, 1983).

Mediating Influences

The New Chance intervention is included in the model because this is the point at which the program was implemented, and to highlight one logical point of policy intervention for this group. Because the impact of the program was negligible in many respects for both mothers and their children, the experimental and control groups are analyzed jointly. Since participation in work and educational pursuits is the means through which New Chance sought to impact mothers, these factors are included here. These measures are not limited to treatment group mothers since control mothers could and did seek out similar services and activities in their communities (Quint et al., 1997).

However, it is also likely that intensity of participation is related to maternal characteristics and resources—the domain to be described next.

Maternal characteristics and resources are conceptualized as mediating factors upon which the program and support services might operate to affect parenting and the home environment. They are diagrammed to show relationships to both maternal and child background characteristics. These include measures of the young women's psychological well being represented by depression, parenting stress, and social support indices, in addition to living arrangements and financial resources. Other unmeasured characteristics within this domain might include aspects of mothers' motivation.

Maternal depression has been found to be negatively associated with child behavior (e.g., Hubbs-Tait et al., 1996; Jacob & Johnson, 1997; Richters & Pellegrini, 1989). Parenting stress acts as a risk factor, while the presence of social supports mediates stress and other negative influences that may lead to poor parenting, for example, as reflected in child abuse and neglect (Kotch, Browne, Ringwalt, Dufont, & Ruina, 1997). Living arrangements may also affect social support, particularly whether the mother lives with any other adults (including a parent, friend, or a romantic partner), or alone with her children. Families' financial resources are important to their general well being and have been tied to child outcomes (e.g., Smith, Brooks-Gunn, & Klebanov, 1997). According to the program designers' intent (rather than observed results), these factors are diagrammed as being affected by New Chance, and also as the primary determinants of the child-rearing environment.

The primary mechanism for impacts on child outcomes to occur is through the child-rearing environment. This was conceptualized to include a number of dimensions of parenting, such as parenting style, time inputs, and financial inputs to the child (i.e., decisions about how to spend finite financial resources). A measure of the quality of the home environment (the Home Observation for Measurement of the Environment Short Form) served as the primary vehicle to assess this construct. Support for use of this construct may be found in Garrett, Ferron, Ng'andu, Bryant, and Harbin's (1994) structural model of child development (based on Children of the National Longitudinal Survey of Youth, or NLSY), where home environment was the most important predictor of children's outcomes. Maternal characteristics were indirectly related to development by way of a direct relationship to home environment (Garrett et al., 1994).

While paternal influences on child development are not a focus in this dissertation, paternal involvement is included in the model for completeness. A line of direct influence is drawn from fathers' involvement to child development, although the support for this connection is a subject of dispute in the literature (e.g., see Furstenberg, Morgan, & Allison, 1987, and King, 1994). A second line connects father involvement and maternal characteristics and resources. Maternal psychological well being may be related to her relationship with her child's father. There is no suggestion of causality—troubled relationships may induce depression, or depression may place strain on a relationship. Lastly, the father's payment of support or other contributions of goods can affect family financial well being.

Use of daycare is related to program participation because, at least initially, program experimental group mothers increased their use of market, or purchased daycare. Over time, treatment and control mothers became similar in their use of market childcare (Quint et al., 1997). The broken line that connects the child-rearing environment and daycare use is to recognize that parents may learn from and, in some cases, imitate caregiver behaviors they observe modeled in the daycare setting (e.g., Zaslow et al., 1994). A solid line connects daycare and child development because daycare has been shown to impact child development, and because this was one of the primary pathways by which New Chance hoped to impact children. The aspects of daycare that were emphasized here were the type, timing, duration, and stability of care.

Outcomes

Child development is illustrated as the recipient of the previously described influences. In theory, child development includes a broad array of constructs, such as aspects of cognitive development, and social and emotional development. In this project child development was more narrowly defined to include a measure of school readiness and one of behavior problems, as was discussed briefly in Chapter 1.

Finally, although they are not included directly in the current project, community environmental influences are noted at the bottom of the chart. Environmental influences represent the wider social context in which the family lives. This wider context encompasses structural resources, such as playgrounds and parks. For example, within a neighborhood, safety, resources, and norms for behavior impact the families that live there (Brooks-Gunn, 1995). Norms about the use of prenatal care and the availability of care for low-income families can impact the health of children. Paternal involvement also can be influenced by institutional structures that provide disincentives for such involvement (e.g., welfare regulations that withhold a portion of the support a father contributes if he pays through official channels). Environmental influences may also have a direct impact on children's development, although this effect may be different across age groups. For instance, very young children will presumably have fewer interactions with the larger environment (Chase-Lansdale, Gordon, Brooks-Gunn & Klebanov, 1997). As they grow older and more autonomous they will interact with neighborhood peers, community members, and eventually schoolmates, and teachers, when environmental influences will become more important (Chase-Lansdale et al., 1997).

This conceptual framework acts to organize the multitude of variables that could be included in an examination of which act as important risk and protective factors for children's development. In addition to answering questions about important predictors of child outcomes, these categories of variables are used to provide information about where programs such as New Chance should concentrate their resources.

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CHAPTER 3

METHODS

The goal of this chapter is to define the methods used to answer the research questions and to provide information useful to program developers on the utility of improving various familial characteristics to benefit children's development. The research questions investigated are, (a) what factors were the best predictors of adverse developmental outcomes in this sample of children born to teenage mothers, and, (b) does the use of non-maternal childcare affect child development in predictable ways?

Participants

Women and their focal child who completed interviews at both first and second follow-ups, who identified themselves as Black, White, or Hispanic, and who had complete data on the response and explanatory variables of interest were selected for analysis ($\underline{n}$ = 1,306). The demographic make up of the analysis sample differed in only minor respects to that in the larger group who completed the second follow-up interview. Tests for significant differences in proportions of people from demographic categories between the two samples were non-significant, giving weight to the proposition that the analysis sample was appropriate to use.

The entire New Chance sample consisted of 2,322 women and their focal child, 1,938 who were interviewed at the first follow-up, and 2,079 who were interviewed at the second follow-up. Subjects were from disadvantaged circumstances, as per program recruitment requirements. A majority had poor academic skills, with more than 44%

reading at a 7th grade level or below. All had given birth as teenagers, and all were living in poverty, with the vast majority collecting welfare benefits at the time of sample enrollment (see Table 2).

Procedure

The study questions were examined through logistic regression analysis of models conforming to the general conceptual framework developed in Chapter 2. Two types of outcomes were examined: cognitive development as represented by scores on the School Readiness Component of the Bracken Basic Concept Scale, and ratings of behavior problems by mothers and teachers on the Behavior Problems Index.

Models of adverse outcomes (described fully in the following section) were predicted from variables representing mediating influences such as maternal characteristics and resources, the child-rearing environment, and use of daycare, controlling for immutable background characteristics. Because the study questions were concerned with investigating risk and protective factors for adverse developmental outcomes, logistic regression models were used. This is an appropriate methodology for a binary outcome. Moreover, the outcome measures used in New Chance are more easily understood as binary indices of cognitive development and behavior problems than as finely calibrated scales. Of course, dichotomizing a continuous outcome ignores some information. However, there is a qualitative aspect to levels of quantitative data—a "consequential validity"—if cut points are chosen carefully (Messick, 1989). Social constructs are applied to most commonly-used continuous measurements (e.g., colleges

Table 2

Characteristics of the New Chance Second Follow-up and Analysis Samples

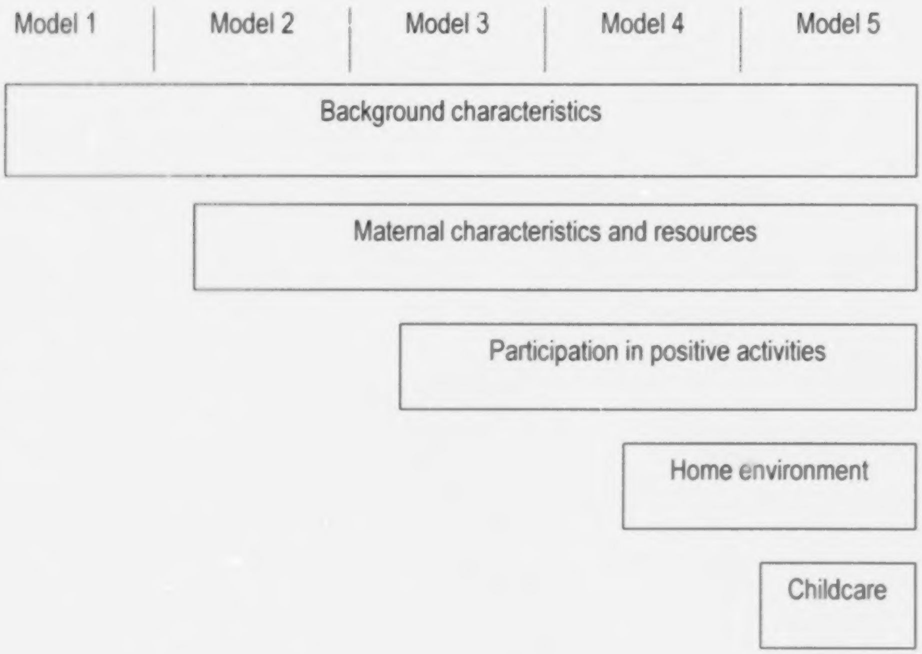
Characteristic	Second Follow-up	Analysis Sample
Race/ethnicity		
Black	52%	55%
Hispanic	23%	24%
White	23%	21%
Highest grade completed		
≤ 7th grade	3%	3%
8 – 10th grade	64%	62%
11th or higher	33%	35%
Receiving AFDC (own/other grant)	94%	95%
TABE grade equivalents (reading)		
7th grade & below	44%	44%
8th – 10th grade	34%	37%
11th – 12th grade	19%	20%
High risk of depression (CES-D ≥ 16)	53%	52%
Age at first childbirth		
≤ 14	5%	4%
15 – 17	62%	61%
18 – 19	33%	34%
Experimental group	67%	66%
Sample size	2,079	1,306

Note. All characteristics measured at the time of sample enrollment.

routinely place a cut score on prospective students' SAT scores and mental retardation is defined by law as an IQ under 70). Recognizing that categorizing outcomes results in loss of complexity, it nevertheless was reasonable to isolate groups with meaningfully distinct scores on the achievement and behavior measures and examine the utility of explanatory variables to serve as risk or protective factors, given the epidemiological focus of the research questions. Moreover, the resultant odds ratios are intuitively appealing and easy to understand. For a supplementary analysis using linear regression to model continuous outcome variables, see Appendix B.

Modeling. Three sets of logistic models were estimated for each of the two developmental outcomes. This section details each in turn. The first set of logistic models were theoretically-based and examined the value of important constructs in influencing child development (described in Chapter 2). As shown in Figure 1, maternal background characteristic were hypothesized to be mediated by maternal characteristics and resources. In turn, these were hypothesized to be mediated by the child-rearing environment as the primary mechanism through which mothers influence their children's development. The measured impacts of these constructs on children's development, controlling for background characteristics, indicates their value in improving child outcomes. Accordingly, a series of five theoretically-driven logistic regression models were built for each outcome (see Figure 2). The first included only variables previously described as important background characteristics. Subsequent models incorporated a successive group of variables representing the domains described in Chapter 2: maternal

Figure 2. Construction of Theoretically-Based Models


Model 1
Model 2
Model 3
Model 4
Model 5
Background characteristics
Maternal characteristics and resources
Participation in positive activities
Home environment
Childcare

characteristics and resources (psychological and financial well being), intensity of participation in positive activities, the child-rearing environment, and daycare. The results of these successively more comprehensive models allowed conclusions about the relative value of attempting to improve mutable characteristics (e.g., the home environment) in terms of benefits to child development.

The second set of analytic models were parsimonious exploratory models, controlling traditionally-used biological characteristics: race/ethnicity, child age, and gender. Exploratory models were estimated to examine the predictive power of individual variables and to see if particular categories of risk or protective factors emerged that could help to shape the design of future program intervention strategies to improve child outcomes. Control variables were forced into the equations; all others entered only if they would contribute significantly to the Global Score statistic (analogous to an overall F test in linear regression; Stokes, Davis, & Kotch, 1995).

Before beginning the exploratory modeling, the sample of 1,306 was randomly divided into two smaller groups. The first group consisted of 75% of the total (n = 985) and will be referred to hereafter as the index sample. The remaining 25% (n = 321) will be referred to as the validation sample. This allowed generalizability testing of the exploratory models developed using the index sample by applying them to the validation sample.

The exploratory model building for each of the response variables (school readiness and behavior ratings by mothers and by teachers) proceeded according to guidelines put forth in Hosmer and Lemeshow (1989). Although a set of biologically-based control variables commonly used in developmental research was always included in the models (i.e., race, child age, and gender), other potential variables first were evaluated for their efficacy.

A series of univariate logistic regressions was run to select the universe of predictors with significant relationships to the outcome. Variables with a likelihood ratio test significant at $p < .25$ were retained for use in exploratory models. A likelihood ratio test is simply the difference between the –2 Log Likelihood values of the single parameter model and the intercept- only model, with one degree of freedom. This value has a chi-square distribution (Hosmer & Lemeshow, 1989). The exploratory models were then built with the potential to include any of the variables that were able to significantly improve the Global Score statistic in addition to control variables that were always included.

Continuous explanatory variables with meaningful cut points were dichotomized for use in the equations. Further exploratory analysis was conducted on those continuous variables that did not have intrinsically meaningful cut points to determine their optimal functional forms. Testing for linear relationships was accomplished according to the recommendations of Hosmer & Lemeshow (1989). Each continuous variable (e.g., scores on the parenting stress index) was divided into quartiles, creating four new dummy-coded variables. These variables were then entered into a logistic model, using the one containing the lowest 25% as the comparison. The resulting logistic parameter estimates were plotted for the midpoints of each quartile and the resulting graphs examined for deviations from a linear pattern. In nearly every case, continuous variables showed clear linear patterns. In many cases, the top 15 or 25 percent of the distribution was chosen as the cut point for continuous explanatory variables to examine the effects of extreme scores on the outcomes.

Finally, the third set models was constructed to test subordinate hypotheses about the expected direction of influence of predictors on each outcome. These hypotheses are embedded in descriptions of the explanatory variables to follow. For each hypothesis concerning the actions of individual variables, three logistic equations were computed. The first models were univariate logistic models regressing only the particular response variable on the explanatory variable. The second models used the explanatory variable controlling for traditionally used biologically-based factors (i.e., race, child age, and gender). Finally, the explanatory variables were entered controlling for both biologically-based and social background characteristics (i.e., years of mothers' education, mothers' welfare histories as children, and poverty status of the family). Hypotheses for the actions of explanatory variables were considered confirmed if the variables operated in the way predicted and if they remained significant with all these characteristics controlled. If a variable was used in the theoretical models, the effects were not replicated in the hypothesis-testing models.

Outcome Measures

This section describes the two measures used as response or outcome variables in the analyses that follow in Chapter 4. Appendix A gives a fuller description.

School Readiness Component of the Bracken Basic Concept Scale (BBCS). The achievement-related measure used in New Chance was the 61-item School Readiness Component portion of the BBCS (Polit, 1996). The BBCS is appropriate for children 2 years, 6 months, through 7 years, 11 months (Estabrook, 1985).

The BBCS consists of a series of plates with four or more pictures on each. For each plate, the child is asked to point to the picture that represents a particular concept (Estabrook, 1985). There is no floor, as all children begin with the first plate. A ceiling is established when the child answers three consecutive queries incorrectly. Correct answers are summed, with all items above the ceiling counted as incorrect even though they were not presented to the child. Raw scores were converted to standard scores based on instructions "provided in the BBCS manual" (Polit, 1996). Standard scores range from 1 to 19. Appendix A outlines previous work on the reliability and validity of the BBCS.

The usual practice when using binary outcomes involves examining groups at the tails of the distribution (often those at or above one standard deviation above the mean). This would have mean using a score of three or four as the cut point on the BBCS. However, Stebbins and MacIntosh (1996) found that children previously identified to be at risk for developmental delay scored at or below seven on the School Readiness Component of the BBCS. Use of both cut points was examined and found that for nearly every explanatory variable, the magnitude of the likelihood ratio test and Wald statistics were much smaller than when using a cut point of seven. Therefore, the cut point of seven was preferred.

Behavior Problems Index (BPI). The second outcome measure, children's behavioral development, was measured by scores on the Behavior Problems Index (BPI) developed by Nicholas Zill and James Peterson (Polit, 1996). Both maternal and teacher ratings were collected, although maternal scores were considered the main behavioral outcome because they are the most commonly used index of child behavior in studies of younger children. As noted in Appendix A, this 28-item (26-items for children not in school) measure was developed from a number of widely-used child behavior inventories. Mothers rated whether each item (e.g., doesn't seem sorry after misbehaving) was not true, sometimes true, or often true of their focal child. For this project, behavior problem indices were derived through exploratory factor analysis described below, rather than following procedures used to create behavior outcomes for the New Chance evaluation.

In New Chance, the BPI was used as a total score and with six subscales: Antisocial, Anxious/Depressed, Headstrong, Hyperactive, Dependent, and Peer Conflict/Withdrawn. Raw scores on the BPI total score and six subscales were converted to normed scores on the basis of data from the 1981 National Health Interview survey (Polit, 1996). For New Chance, the scores were normed separately within years of age for boys and girls, and if the child was under 6, by whether they were attending school or not, as per the procedure followed in the National Longitudinal Survey of Youth (NLSY;

Center for Human Resources Research, 1997). McDermott (1993) however, argues against creating separate norms for child behavior based upon gender or age because it distorts the make-up of the group defined as behavior disturbed. For example, the clinical representation of hyperactivity is 3:1 boys to girls (American Psychological Association, 1987). Within-group norming has the effect of equalizing the number of hyperactive boys and girls. Thus, a boy exhibiting the same frequency and type of behaviors as a girl would not be classified as hyperactive, while the girl would be. In addition, the six maternal-rated subscales used in New Chance had very low internal consistency (ranging from .49 to .60; Polit, 1996), indicating that the subscales did not have adequate cohesion.

Scaling of the BPI (Maternal)

The BPI was subjected to exploratory common factor analysis to determine the optimal use as a response variable with hopes that a multidimensional behavior score would result. In actuality, a multidimensional score was not viable, and a total BPI score was used instead.

New scaling of mother-rated BPIs followed nine steps. First, the large sample was randomly split to two smaller samples of approximately equal size, one serving as the scaling sample and the other as a validation sample (ns= 639 and 667 respectively). Then, within the scaling sample, individual item analysis was undertaken to note patterns of response and item-level measures of central tendency. The internal consistency of items as a group was examined next. At this stage, items were deleted if they did not have acceptable cohesion with others in the group. The remaining items were subjected to exploratory common factoring with various orthogonal rotations and the adequacy of the solutions was examined. When a satisfactory orthogonal solution was found, an oblique rotation was applied as one confirmatory step. Final confirmation was obtained by subjecting the solution to oblique multiple-group principal-components cluster analysis. The stability of the solution was tested by applying it to the validation sample and calculating factor matching statistics. Factor matching statistics were also calculated to compare factor structures for subgroups to the larger sample. The resultant factors were also evaluated for the amount of unique and reliable variance they contained, those without sufficient common variance would not be stable enough for use as an outcome measure. Lastly, second order factor analysis was applied to evaluate the viability of a total score.

Prior to scaling the BPI, children's scores on each item of the BPI (excluding items 27 and 28, which were asked only about children who were in school) were extracted and recoded so that "sometimes true" and "often true" were scored as 1 while "not true" was scored as 0. This follows scoring guidelines for the BPI; MDRC also scored the BPI in this way. The analysis sample discussed earlier in this chapter was chosen so that all cases had complete data on all BPI items, therefore missing data was not an issue.

The internal consistency of the scaling sample was assessed with Cronbach's coefficient alpha on all 26 items in the scale. The standardized alpha was .84, and all item-total correlations fell within .24 and .48, well within the guidelines of .20 and .80 (McDermott et al., 1996).

Before beginning the exploratory factor analysis of the BPI, Bartlett's chi-square test was calculated, indicating that a maximum of six factors might be extracted from the matrix (McDermott, 1993). However, the scree plot suggested a maximum of three factors. Alternative models were examined to determine how well they fit the data with regard to (a) item coverage (using the most items possible), (b) parsimony (minimal items loading saliently on more than one factor), (c) minimum scree (remaining within the bounds suggested by the scree plot), and (d) psychological sensibility. Loadings greater than .30 were considered to be appreciable.

The final solution retained two orthogonal factors with a varimax rotation. Varimax is an orthogonal rotation that maximizes the variance across all factors (Gorsuch, 1983). Based on the items with the largest loadings, factor 1 was named "Misbehavior" and factor 2 "Peer Difficulties." Four items were discarded in the final solution because they did not load saliently on either factor or they loaded saliently on both. Inclusion of items that saliently load on more than one factor argues against the integrity and construct distinctiveness of the factors. After discarding the four items, 22 items remained that explained 21% of the variance in the BPI, an appreciable amount. The varimax solution was then subjected to oblique promax rotations with powers raised from two to eight as a confirmatory step. Promax raises factor loadings to increasingly higher powers, which serves to minimize small loadings and maximize larger ones. The percentage of items with loadings in the hyperplane (between –1.0 and 1.0; see Gorsuch, 1983) was highest for the promaxian solution raised to the fifth power (39% vs. 5% for the orthogonal solution). The oblique and orthogonal solutions were the same with the exception of two items that failed to meet the > .30 criterion. The similarity of the oblique to the orthogonal solution was a condition for confirming the orthogonal solution. See Table 3.

For each factor, coefficient alpha and item-total correlations were computed. Each had internal consistency above .70 (the recommended minimum), and item-total correlations within accepted ranges (see Table 4). Next, the varimax solution was subjected to oblique, multiple-group, principal-components cluster analysis as a final confirmatory step (Harman, 1976). This procedure was computed twice, first for the final solution without allowing any items to migrate to different clusters. Results showed that variance for each item was best explained within its own cluster. Next, the same procedure was followed, this time allowing items to migrate to different clusters. No items did so, providing evidence that the solution was an acceptable fit to the data. The two-factor varimax solution was applying to the reserve sample as one test of its stability and viability. All items loaded on the same factors, with the exception of one item that shifted from factor 2 to factor 1. Wrigley-Neuhaus coefficients of congruence (Harman, 1976) were computed to compare the solution in the scaling sample to the reserve and showed that the level of agreement was high, although indicating that the non-matching

Table 3

Exploratory and Confirmatory Common Factor Structures for the BPI

				Confirmatory analysis		
Subscale items [a]	Rotated loading Varimax	Promax[b]	Item-total r[c]	R^2 with own	next cluster	Loading
Misbehavior						
Disobedient at home	.54	.66	.44	.35	.07	.59
Stubborn, sullen, or irritable	.52	.58	.46	.38	.11	.62
Restless or overly active	.45	.51	.37	.27	.08	.52
Has strong temper	.45	.42	.45	.36	.14	.60
Demands a lot of attention	.45	.48	.43	.32	.09	.57
Cheats or tells lies	.40	.42	.37	.25	.08	.50
Has sudden changes in mood	.39	.40	.37	.26	.08	.51
Argues too much	.39	.40	.36	.25	.08	.50
Bullies or is cruel to others	.36	.35	.34	.23	.08	.48
Cries too much	.33	.33	.34	.22	.07	.47
Clings to adults	.31	.32	.31	.19	.06	.43
Peer Difficulties						
Not liked by other children	.45	.52	.40	.30	.06	.55
Easily confused, in a fog	.44	.50	.40	.31	.06	.55

(Table 3 continued next page)

(Table 3 continued)

				Confirmatory analysis		
	Rotated loading			$\underline{R}^2$ with own | next cluster		
Subscale items [a]	Varimax	Promax[b]	Item-total $\underline{r}$[c]	own	next	Loading
Peer Difficulties (cont.)						
Withdrawn	.44	.54	.35	.24	.04	.49
Is too fearful or anxious	.42	.45	.38	.29	.10	.53
Is too dependent on others	.41	.42	.38	.28	.09	.53
Unhappy, sad, or depressed	.40	.38	.39	.30	.12	.54
Trouble getting along with others	.40	.40	.38	.28	.10	.53
High strung, tense, & nervous	.40	.41	.38	.29	.10	.53
Feels worthless or inferior	.35	.38	.33	.22	.05	.47
Has obsessions	.35	.35	.32	.21	.08	.46
Can't pay attention	.32	.29	.34	.24	.10	.49

	Factor 1	Factor 2
Eigenvalue	2.37	2.14
Cumulative variance	10.8%	20.5%

Note. $\underline{n}$ = 639.

[a] Item wording has been abbreviated for presentation purposes. [b] Entries are derived from promaxian oblique rotation at $\underline{k}$ = 5. [c] Item-total $\underline{r}$ values represent coefficients with the item excluded from the total score.

Table 4

Internal Consistency of the BPI Subscales within Subgroups

	Internal consistency					
Factor	Analysis	Reserve	Male	Female	Black	Non-Black
Misbehavior	.74	.75	.72	.76	.72	.76
Peer Difficulties	.73	.71	.73	.71	.72	.73
Second-order factor						
General misbehavior	.74	.77	.72	.77	.70	.79
Sample size	639	667	331	308	357	282

Note. All tabled values are Cronbach's alpha coefficients computed for analysis sample subjects.

factors were also quite similar to the matching ones ("Invariance" in Table 5). Wrigley-Neuhaus coefficients were also computed to assess the generalizability of the solution to important subgroups. Males and females were compared to the entire analysis sample, as were Blacks and non-Blacks. In each case matching factors showed high similarity to each other, although there was also high similarity to the non-matching factor ("Generality" in Table 6).

Factor scores were computed by a simple (1, 0) unit-weighting procedure. Unit weighting is preferred to other weighting methods for its stability (Wang & Stanley, 1970). Scores were summed then standardized into T-scores (M = 50 and SD = 10) using an area conversion procedure. Area conversion allowed T-scores to be associated with the appropriate percentile and made scores on each factor comparable. This procedure resulted in scores with means of 49 and standard deviations of 9.5 and 9.3 for factors one and two respectively.

Inter-factor correlations using standard factor scores were calculated, and showed that the two factors were highly intercorrelated at a level higher than the usual guideline of < .50 (r = .59) (P. A. McDermott, personal communication, September 26, 1996). Second-order factor analysis was applied next to determine if using a total BPI score was appropriate. Common factor analysis without rotation was performed using the two first order factors. Each of the first order factors loaded saliently on a single second order factor, which explained 47% of the variance in the BPI. The second order factor was named General Misbehavior because each of the two subscales had high loadings on it.

Table 5

Intercorrelations and Second-Order Factor for BPI Subscales in the Scaling Sample

	Correlation [a]		Loading [b]		
Subscale	MB	PD	General Misbehavior	Communality	Specificity [c]
Misbehavior (MB)	--	.59	**.69**	.47	**.27**
Peer Difficulties (PD)	.59	--	**.69**	.47	.26
Eigenvalue			.95		
% Variance			47%		

Note. n = 639. MB = Misbehavior, PD = Peer Difficulties.

[a] Intercorrelations are based on unit-weighted factor scores obtained in first order common factoring. [b] Loadings greater than .30 are considered appreciable and noted in boldface. [c] Specificity refers to the amount of reliable and unique variance associated with a particular subscale (communality is the amount common variance associated with a subscale). Specificity was computed by subtracting the communality for a subscale from its internal consistency (alpha). Values greater than error (error = 1 – alpha) are considered appreciable and are noted in boldface.

Table 6

Coefficients of Congruence for Replication of BPI Factors Across Gender and Ethnic Subsamples

		Generality			
Factor	Invariance	Male	Female	Black	Non-Black
Misbehavior	98(71)	99(74)	99(71)	99(70)	98(73)
Peer Difficulties	98(72)	99(67)	98(72)	99(69)	98(71)
Average both factors	98(71)	99(71)	99(72)	99(69)	98(72)
Second-order factor					
Generalized misbehavior	--	100	100	100	100
Sample size		331	308	357	282

Note. All values are Wrigley-Neuhaus coefficients omitting decimals. Non parenthetical values are similarity between two matching factors. Parenthetical values are the similarity of the given factor to the non-matching factor. Invariance is factor matching between scaling and reserve subsamples, while generality is factor matching to subgroups within the scaling subsample.

To assess the amount of reliable and unique variance within each factor, a necessity for use as separate outcome measures, specificity was assessed for each of the first order factors. Specificity is calculated by subtracting the communality for a subscale from its internal consistency. Specificity values greater than error (error = 1 – coefficient alpha; McDermott, 1993) are considered appreciable. Only the first factor (Misbehavior) factor contained an appreciable amount of reliable and unique variance, therefore, a total score was preferred as the measure of behavior in this study (see Table 5). Total scores were computed by summing the 22 items remaining in the solution and standardizing them into *T*-scores via area transformation. After this procedure, maternal BPIs had a mean of 49.1 and a standard deviation of 10.6.

Scaling of the BPI (Teacher)

Teachers completed ratings for children who were in school at the second follow-up. In order to make maternal and teacher rated BPIs maximally similar, an analysis was undertaken to determine if a total teacher BPI score using the same items as maternal BPIs was warranted. Internal consistency of teacher BPIs was high ($\alpha = .91$ on all 22 items used for maternal BPIs). Internal consistency held up for important subgroups as well, see Table 7.

For both maternal and teacher BPIs, total scores were transformed into *T*-scores through area conversion and dichotomized at a *T*-score of 60 (one standard deviation above the mean). A score one standard deviation above the mean or higher is considered indicative of a behavior problem in most research of this type. Therefore, scores at least

Table 7

Coefficient Alpha for Subgroups on the Teacher-Rated BPI

	Alpha	Sample size
Race/ethnicity		
Black	.91	296
Hispanic	.87	126
White	.91	89
Sex		
Girls	.89	257
Boys	.91	254
Overall alpha	.91	511

Note. Coefficients were calculated using 22 items of the BPI used in scoring the maternal version of this form.

one standard deviation above the mean were coded as 1 and all others as 0, so that logistic models predicted problem behavior.

A comparison of dichotomous maternal and teacher ratings showed that there was little correspondence in ratings of problem behavior between mothers and teachers. Of the 127 children who had both types of behavior ratings and who were rated as having problem behavior by either rater, there were only 16 cases in which both mother and teacher ratings indicated problem behavior.

Explanatory Variables

Explanatory variables will be described in the context of the categories outlined in the conceptual model shown in Figure 1. The form that variables should take was explored extensively in the modeling process which will be described in Chapter 4. Explanatory variables were expected to function in generally similar ways for each outcome. That is, while identical prediction was not expected, a variable that acted as a risk factor for one outcome would not be expected to act as a risk factor for another, although a variable may show no relationship with one outcome and a statistically significant relationship with another.

The sections below detail the variables used to represent each domain. Some concepts will be represented by information collected at one or both follow-up interviews. However, including explanatory variables measured at the second follow-up, at the same time as the outcome variables, presents conceptual difficulties. When the intent is simply to describe relationships between explanatory and response variables, contemporaneous measurement is not a concern because there is no assumption about the direction of causation. This study sought not only to make accurate predictions of child development, but also to put forth a model of possible pathways of influence, with children as recipients of parental influences rather than as potentially influencing them. Therefore, to avoid possible confusion about direction of influence, the explanatory variables generally are restricted to those measured at baseline or the first follow-up—well before the reference period for the outcome measures.

A few cases, including some variables measured at the second follow-up, did not present these measurement problems (or presented them to a lesser extent) because they were by nature transitory states. Since a state measurement is ephemeral and theoretically could last only days or even hours, there seemed to be less utility in using a state measurement collected upwards of 1 1/2 years before the outcome measurement. Use of some contemporaneous measures would convey information about their actions as risk or protective factors for the outcomes, irrespective of whether they acted to influence the particular outcome. Therefore, variables of interest measured at the second follow-up that represented states (rather than more immutable traits) were included. Some examples of state variables were depression, maternal health, parental stress, and maternal satisfaction with support. While it is possible that child development (behavior in particular) could indirectly impact poverty status and living situations, these possibilities seemed remote. Therefore, second follow-up measures of poverty status, living arrangement, and home environment were used. HOME-SF scores at the second follow-up had the additional benefit of being the more reliable of the two administrations (as measured by Cronbach's alpha; Polit, 1996).

Maternal characteristics that might more readily affected by the children concerned education and employment. For instance, a poorly behaved child could impact a mother's efforts to seek work or to attend classes. Therefore, variables representing aspects of employment and education were restricted to those collected at the first follow-up.

Maternal background characteristics. Maternal background characteristics were considered potential control variables and included: mother's age at first childbirth, race/ethnicity, highest grade completed, whether her family continuously received welfare when she was a child, whether she was ever employed, and Centers for Epidemiological Studies-Depression (CES-D) score at baseline. All measurements of background characteristics were made prior to random assignment into either the experimental or the control group.

Prior employment and increasing years of education were expected to reduce risks of poor outcomes. Long term welfare receipt during the mothers' childhoods (a measure of poverty), minority group status, and depression were expected to act as risk factors.

Child background characteristics. Child background characteristics included gender, birth weight, age, and birth order. Birth order was represented by first born versus later born. In this study, male children and first borns were expected to be at increased risk for adverse outcomes. (Although the literature generally finds advantages for first borns, this has not been the case for the first children of teenage mothers, e.g., Kinard, 1990). Conversely, increasing weight at birth was expected to act as a protective factor.

Maternal characteristics and resources. A number of disparate mediating factors were included within maternal characteristics and resources, each measured at both first and second follow-ups. First were those variables that represented maternal psychological well being: CES-D (depression) scores, parenting stress scores, satisfaction with social supports, and maternal ratings of her physical health. Depression scores on the CES-D can range from 0-60, with a score of 16 considered the threshold for risk of depression. Scores of 24 or higher are considered indicative of depressed state.

Parenting stress was measured with an 8-item scale adapted from Abidin's Parenting Stress Index (Quint et al., 1997). Scores could range from 0 to 80, with higher scores indicating more stress. Mothers also were asked to rate how satisfied they were with the quality of the support they received on a 0-10 scale and whether or not they were in good physical health. Finally, mothers were asked if any other adults resided in the household. Depression, parenting stress, and living without other adults were conceived as risk factors, while social support and health status were expected to operate as protective influences in mediating child outcomes.

The study also included two measures of financial resources available to the mother. The first measure of financial resources was whether total family income for the year was below the poverty line (in 1991 dollars) at the time of the second follow-up.

The second was the families' AFDC receipt (cash assistance) throughout both follow-ups. AFDC receipt was classified into those who, at any time during the second program period, were able to stop receipt for at least 3 months, versus those who were not. Cessation of welfare receipt was expected to act as a protective factor because, New Chance operated prior to recent welfare reforms. It was assumed that suspension of benefits would have occurred primarily because the recipient had found another source of income, such as employment.

Intensity of participation in positive activities. The expected success of New Chance was predicated on women's participation in education and eventually, work activities. In fact, the primary explanation for the mostly null effects of the program was the similarity between experimental and control women in their pursuit of these activities (i.e., experimental group women participated in education less than anticipated and control group women more than anticipated; Quint et al., 1997). Therefore, variables representing participation in work and education were included for all sample members. These variables were conceptualized to be related to maternal characteristics and resources. That is, aspects of motivation, psychological and social support would be expected to impact participation in education and work activities, which in turn would be expected to time and goods inputs into child-rearing as well as maternal psycho-social characteristics and parenting practices.

Participation in New Chance was represented with a binary variable indicating experimental versus control group membership, although given published findings summarized in Chapter 1 (see also Quint et al., 1997), this measure was not expected to predict child development. Although significant differences in behavior ratings were noted between experimental and control group children, the differences were quite small in magnitude (mean maternally rated BPI scores were 110.0 and 108.5 for experimental and control group children respectively) (Quint et al., 1997). Intensity of participation in education and work activities for both experimental and control group members included the number of weeks of education, whether she earned a GED or high school diploma, the proportion of time that she was employed, and the total hours worked, each by the first follow-up.

Increasing weeks of education and hours worked, proportion of the time employed, and earning a high school credential were each expected to act as protective factors for each of the developmental outcomes examined in this study.

Daycare use. A number of questions about the focal child's primary daycare placement were asked at the time of the first follow-up. Of particular interest were those questions that focused on the current type of regular care, the timing of care, the duration of care, and the stability of care.

Types of care included center-based care or family daycare. Timing of daycare was recorded as whether the child began any type of regular care prior to his or her first birthday. Duration of care was measured by a variable representing the proportion of the 18 months since random assignment the child was in any type of market (or purchased) childcare. In addition, variables for the proportion time spent specifically in either center-based or family daycare between random assignment and the first follow-up survey were included.

Calculating the duration of time in either center-base or family daycare was accomplished as follows. Because at times the first follow-up interviews did not occur exactly 18 months after random assignment, the variables denoting months in childcare did not always represent the same time span for each person. Therefore, dates of random assignment, the actual first follow-up interview, and a date exactly 18 months from random assignment (the "ideal" 18 month interview date) were compared to the dates reported for childcare usage. A small percentage of the sample was interviewed after the first date. Months in care were adjusted for these variations in the following way. Dates for childcare usage were compared to the date of random assignment and the ideal first interview date respectively. If a date for reported childcare usage began prior to random assignment, or ended later than 18 months from random assignment it was subtracted from the appropriate date (i.e., the late reports were subtracted from the ideal 18 month interview date). These values were then subtracted from the total months in care. The resulting values were converted into proportions of time spent in either a daycare center or family daycare and then rounded.

Finally, the stability of care was represented by a measure of the average number of daycare arrangements experienced by the first follow-up. When used in models, child age was controlled because this was a potential confounding variable. Other things being equal, center-based care was expected to have increased benefits for children compared to family daycare settings. Although exposure to any type of childcare was expected to benefit children relative to having only maternal care. Early exposure to care was hypothesized to be more beneficial than later exposure, and increasing duration of time spent in care and greater stability of care (fewer changes in arrangements), were also expected to lead to more positive child outcomes.

Child-rearing environment. The measure of home environment was the Home Observation for Measurement of the Environment Short Form (HOME-SF), which measures qualities of the home environment that have been shown to predict child outcomes (Bradley, 1994). The HOME-SF has been used in large national surveys such as the NLSY. Three versions of the HOME-SF (Infant/Toddler, Preschool, and School-aged) were used at the first interview, but only the latter two were used at the second follow-up because the children were then too old for the Infant/Toddler form. All HOME-SF versions involved a semi-structured interview of the caregiver in addition to observer ratings. Items are typically scored as either present or absent, and then summed.

The HOME-SF as used in New Chance had a total score and four subscales: Cognitive Stimulation, Emotional Support, Physical Environment, and Harsh Discipline. Total HOME-SF scores from each form were standardized to have a mean of 100 and standard deviation of 15 so that "data from the entire sample could be aggregated, regardless of which form was administered" (Polit, 1996, p. 8). However, altered versions of the HOME-SF were developed for the second follow-up after low internal consistency was noted in the scores from the first follow-up (Polit, 1996). The changes included adding several items (drawn from the original version of the HOME under the guidance of one of the original test developers), rewording of other items, and substituting 3-point, rather than dichotomous rating scales (Polit, 1996). Before these adaptations, the internal consistencies for total scores on the two HOME-SF versions used at the first follow-up (the Infant/Toddler and Preschool) were only .41 and .61. After the modifications, the obtained reliabilities for total scores at the second follow-up were above .80.

Alterations to an existing instrument, while commonly done, change the instrument. Thus, the measure can no longer be assumed to behave in the same way as the original. In addition, because there were two forms of the HOME-SF, it was not possible to assume that the alterations worked in similar ways across instruments. Equivalency studies involving the same subjects taking both versions of an instrument are recommended to investigate the commonality of constructs measured across different versions (Standards for Educational and Psychological Testing, 1985). Therefore, an analysis was undertaken to examine ways that the altered HOME-SF might be used as an explanatory variable in this project. Because of the greater reliability of the second follow-up forms, these HOME-SF items were re-examined. The procedure is fully described in the scaling section below.

Scaling of the HOME-SF. The aim of the analysis of HOME-SF scores was to investigate alternative ways that the HOME-SF might be used as an explanatory variable in logistic models. Because constructs across HOME-SF forms could not be assumed to be equivalent (scores would have to remain separate for each form), one potential course of action would have been to create separate scores based on the form used and to construct separate logistic models for children. Another would have been to simply discard school-aged children from subsequent analyses (they were the smaller group), and use only the preschool form. This solution was less desirable because of the loss of information on a wider age range of children.

In order to investigate using separate HOME-SF scores based on child age, an attempt was first made to confirm the factor structure reported by Polit (1996). Children in the base sample who were under the age of 6 at the second follow-up and therefore had taken the Preschool form (n = 1,020) were selected for analysis. This group was chosen because it was the largest.

Forms were scored using procedures outlined by Polit (1996)—these involved recoding and collapsing items. The internal consistency of the subscales used in New Chance was evaluated by computing Cronbach's alpha for items within each of the four domains (Cognitive Stimulation, Emotional Support, Physical Environment, and Harsh Discipline). Then, a confirmatory oblique multiple-group principal-components clustering procedure was applied to test the integrity of the hypothesized subscales. The solution would be confirmed if the variance of particular items was best explained by other items in the subscale, and if no items moved to other clusters (subscales) when allowed.

Conventional rules of thumb recommend alpha values of .70 or higher, with item-total correlations within .20 to .80. Three of the subscales met the overall alpha criterion (Cognitive Stimulation, Emotional Support, and Physical Environment), although both Cognitive Stimulation and Physical Environment had several item-total correlations outside recommended parameters. The Harsh Discipline subscale had coefficient alpha well below guidelines (alpha = .49, cf. alpha = .46 reported for the second follow-up Preschool form; Polit, 1996).

A confirmatory oblique, multiple-group, principal-components cluster analysis was next performed on all items in an attempt to confirm the factor structure used in the New Chance evaluation. Confirmation of the original solution would result if the variance for each item ($\underline{R}^2$) was highest within its own cluster. Because of the low reliability of the Harsh Discipline subscale, confirmation of only a three-factor solution was attempted. This analysis showed that two items within the Cognitive Stimulation cluster had higher $\underline{R}^2$ values in other clusters, and migrated when allowed. This indicated that the three-factor solution was not confirmed. Possible reasons for the lack of confirmation were the differences in samples used (to avoid data imputation as was done originally, the sample was restricted to those with complete information on all items). It was also unclear what guidelines were followed to determine the factor structure used in the original analysis. Because the Preschool structure was not confirmed, there was no attempt to confirm the structure of the School-aged form, since separate equations based on the form used would still be required. Instead, in the interests of parsimony, an investigation of an alternate use of HOME-SF scores was undertaken.

The utility of total scores that could be used for all children regardless of age were investigated next. This involved examination of the 29 items common to both HOME-SF versions. These items also were scored according to the procedures used by MDRC (this involved recoding of some items and collapsing others, see Polit, 1996). Most of the items in common between the two forms were observer ratings of mother-child interactions and the physical condition of the home. Two items requested the mothers' responses.

The alpha coefficient was calculated for the entire group of common items, yielding a value of .82. Although showing an acceptable overall internal consistency, several items had very low item-total correlations. The recommended parameters for item-total correlations are between .20 and .80 (McDermott et al., 1996). Because Allen and Yen (1979) recommend discarding items with low item-total correlations, all items with item-total correlations outside recommended parameters were removed and the values reexamined until 18 items remained. The overall alpha was .85 and all item-total correlations were within accepted parameters. Table 8 lists the common HOME-SF items; items with asterisks were retained.

Next, internal consistency was calculated for important subgroups (based on gender, race, and age). This resulted in robust alpha coefficients for each subgroup (see Table 9). High internal consistency overall and within subgroups made use of a total score a viable option. Thus, individual items were standardized to have a mean of ten and standard deviation of three through linear conversion, then summed. This derived

Table 8

Items Common to the Preschool and School-aged HOME-SF Inventories

HOME-SF Item
1. As a place to raise children, would you say your neighborhood is: (Excellent, very good, good, not too good, or awful).
2. About how many magazines does your family get regularly, either on the newsstand, by subscription, or from friends?
3. How often does your family get a newspaper, either on the newsstand, by subscription, or from friends?
*4. About how many hours is the TV on in your home each day?
5. How often do you read stories to (CHILD)?
6. How often do you and (CHILD) get to go to the library/Do either of you have a library card?
7. Is there any kind of musical instrument—for example, a piano, drum, guitar, and so on—that (CHILD) can use here at home?
*8. How often have you or another family member taken or arranged to take (CHILD) to any type of museum—children's, scientific, art, historical, etc., within the past year?
Observer rating:
*9. Mother's voice conveyed positive feeling about this child.
*10. The rooms in the house/apartment are clean.
*11. The interior of the home is dark or perceptually monotonous.
*12. The rooms in the house are cluttered or messy.

(Table 8 continued next page)

(Table 8 continued)

HOME-SF Item
13. The household was noisy and chaotic during the visit.
14. How many books are visible in R's [b] apartment/house?
*15. Are there any pictures, posters, or art work on the walls of R's home?
Did mother:
16. Slap or spank child
17. Scream or yell at child in a harsh or hostile manner?
*18. Spontaneously praise child's qualities or behavior?
*19. Mother answered child's questions or requests verbally.
*20. Mother introduced interviewer to child.
21. Did (CHILD) spontaneously make positive attempts to get his/her mother's attention?
*22. Did (CHILD) spontaneously seek positive physical contact with his/her mother (such as hugging, kissing, snuggling?)
*23. How well kept are the exteriors of the structures in the vicinity of R's home?
*24. How pleasant and aesthetically pleasing is R's neighborhood?
Rate the interior of R's home on a 0 – 10 scale:
*25. Filthy ◄──────► Very clean and tidy
*26. Numerous bugs or rodents ◄────► No visible evidence of bugs or rodents
*27. Very poor condition ◄─────► Well kept and in good repair
*28. (Mother) Very poor hygiene ◄──► No evidence of poor hygiene
*29. (CHILD) Very poor hygiene ◄──► No evidence of poor hygiene

Note. *Only items with asterisks were included in the new home environment total score.

[a] Items have been abbreviated in some cases for convenience of presentation.

[b] R refers to Respondent.

Table 9

Coefficient Alpha for 18 Common Items of the HOME-SF for Subgroups

Subgroup	Alpha	Sample size
Age group		
< Age 6	.85	1,084
≥ Age 6	.84	252
Race/ethnicity		
Black	.83	711
Hispanic	.85	313
White	.86	276
Sex		
Girls	.84	622
Boys	.85	684
Overall alpha	.85	1,306

score was the home environment measure used in this study.

Research Questions

Two research questions were posed at the outset of this project:

1) What factors were the best predictors of adverse developmental outcomes in this sample of children born to teen mothers? and,

2) Does the use of non-maternal care affect child development in predictable ways? The answers to these questions would have implications for developers of two-generation programs.

Research question 1 was addressed with the theoretically-based and exploratory models, and to a lesser extent, the hypothesis-testing models. Research question 2 was addressed primarily by the theoretically-based and hypothesis-testing models.

CHAPTER 4

RESULTS

The intent of this chapter is to develop parsimonious models predicting children's performance on measures of school readiness and their behavior problems and to test hypotheses about the determinants of these outcomes. The outcome measures adopted for the New Chance program were the School Readiness Component of the Bracken Basic Concept Scale (BBCS) and the Behavior Problems Index (BPI), described in chapter 3 and more fully in Appendix A. This chapter first describes the characteristics of the response and explanatory variables. Then, it reports the results of the series of theoretically-based empirical models testing specific hypotheses that derive from the conceptual model. The chapter next turns to the exploratory multivariate models designed to identify groups at particularly high risk of poor outcomes. The exploratory models were evaluated by applying them to the validation sample. Lastly, the chapter outlines results of tests of subordinate hypotheses (i.e., tests of the performance of individual variables and effects of childcare). The chapter concludes with a post-hoc power analysis.

Response Variables

Scores on the BBCS were normally distributed with a mean of 6.8 and standard deviation of 2.8. Polit (1996) reported that a score of 6.9 was equivalent to a score of 84 on a standard score scale with a mean of 100 and standard deviation of 15. This is slightly more than one standard deviation below the expected mean score for a group of children. Average scores were also low in light of the findings of Stebbins & McIntosh (1996) that scores below 8 were the most accurate in differentiating a group of developmentally delayed children from those without developmental problems. These scores are not surprising given the nature of the sample.

The new total BPI scores completed by mothers and teachers were standardized into T-scores (Ms = 49.1 and 49.5, SDs = 10.6 and 9.4 for maternal and teacher rated BPIs respectively). Polit (1996) reported that maternal ratings (total scores) based on scoring and norms for the NLSY tended to be higher than average, indicating more problematic behavior. Elevated behavior problems scores are not surprising given that the sample was selected on the basis of their elevated risk of poor outcomes.

Explanatory variables

Following the conceptual model described in Chapter 2, potential explanatory variables were examined for their abilities to explain poor performance on the outcome measures. The explanatory variables were chosen to represent the categories/domains represented in the conceptual model for their theoretical impact on child outcomes. Table 10 illustrates the sets of explanatory variables examined within each theoretical domain, and presents summary statistics for each.

Analysis of Continuous Variables for Nonlinearity

Continuous variables were examined for linear relationships to the outcome

Table 10

Summary Statistics for Explanatory Variables

Variable	Mean	Standard deviation	Proportion (categorical variables only)	Sample size
Maternal Background [a]				
Age at 1st childbirth	16.9	1.3	--	1,306
Race/ethnicity				1,306
Black			54%	
Hispanic			24%	
White			23%	
Employed prior to New Chance			80%	1,306
TABE grade equivalent (reading)	7.9	2.7	--	1,306
Welfare > 2 years as a child			45%	1,306
Highest grade completed	9.9	1.2	--	1,306
CES-D (depression score)	17.8	10.3	--	1,306
Child Characteristics				
Male			52%	1,306
First born			82%	1,306
Age at Wave II [b] (years)	5.4	1.1		1,306
Birth weight (oz.)	113.0	20.5	--	1,306
Maternal Characteristics & Resources				
CES-D (depression), Wave I [b]	15.6	10.4	--	1,306
CES-D (depression), Wave II [b]	15.1	10.1	--	1,292
Parenting stress index, Wave I [b]	28.0	13.8	--	1,248
Parenting stress index, Wave II [b]	25.7	14.4	--	1,306
In good health, Wave I [b]	--		54%	1,306

(Table 10 continued on next page)

(Table 10 continued)

Variable	Mean	Standard Deviation	Proportion (categorical variables only)	Sample size
In good health, Wave II [b]	--		55%	1,306
Satisfaction with supports, Wave I [b]	8.0	2.6	--	1,301
Satisfaction with supports, Wave II[b]	8.5	2.1	--	1,301
Stopped welfare 3 mo. by Wave II [b]	--		37%	1,306
Below poverty level, Wave II [b]	--		62%	1,306
Living with children only, Wave II [b]	--		39%	1,306
Program Participation/Participation in Positive Activities				
Experimental group member	--		67%	1,306
Weeks of education by Wave I [b]	23	23	--	1,306
Ever employed by Wave I			42%	1,306
% of time employed [c] (of ever employed)	32%	24	--	550
Total hours worked by Wave I [c] (of ever employed)	646	670		550
Earned GED/diploma by Wave I [b]			40%	1,306
Child-rearing Environment				
Home environment score	180	28	--	1,306
Childcare – Type [c]				
Market (paid) childcare by Wave I [b]	--		67%	1,306
Center-based childcare by Wave I [b]	--		55%	1,306
Family daycare by Wave I [b]	--		26%	1,306
Childcare – Timing				
Began any type of regular care prior to 1 yr. of age	--		48%	1,306

(Table 10 continued next page)

(Table 10 continued)

Variable [b]	Mean	Standard Deviation	Proportion (categorical variables only)	Sample size
Childcare – Stability				
Average number daycare arrangements Wave I	2.2	1.4	--	1,306
Childcare – Duration (of those in any care)				
% time in family daycare by Wave I [d]	10%	22	--	656
% time in daycare center by Wave I [d]	31%	35	--	656
Proportion of time in market care				656
1 – 9%			26%	
10 – 25%			12%	
26 – 50%			20%	
51 – 100%			42%	

---

[a] Each background characteristic was measured at random assignment into experimental or control groups. [b] Wave I refers to the first follow-up and Wave II refers to the second follow-up. [c] Multiple responses were allowed. [d] The proportion of the first 18 months after random assignment that the mother was employed.

variables and for the forms they should take in the multivariate models. The continuous variables considered were: mother's age at first childbirth, TABE grade equivalent score, highest grade mother completed, child's birth weight, parenting stress index scores, satisfaction with support ratings, CES-D depression scores, time spent in childcare centers or family daycare), proportion of time in care, weeks of education, total hours worked, and the home environment score.

Hosmer and Lemeshow's (1989) method of creating dummy-coded quartiles then regressing the response variable on them was used to test for linearity. Inspection of the patterns in the parameter estimates showed that each continuous variable had either a clear monotonic linear pattern in its parameter estimates or a completely flat line indicating no relationship. Continuous variables that had a priori meaningful categories, such as depression, were used as categorical variables. Those without clear categories were either retained as categorical, or examined for use as categorical variables. Explication of the decision making process follows for each.

For mother's age at first childbirth, TABE grade equivalent, highest grade completed, weeks of education, and child's birth weight, continuous variables seemed to be the most informative. Remaining in this state allowed odds ratios to vary based on a single unit increase in the respective explanatory variable. For example, given the young ages of the mothers involved, the difference in a single year of delayed childbearing seemed informative from a policy perspective. Likewise, increases of a single grade equivalent on the TABE a single year of education seemed meaningful given the low levels of achievement and past educational success in this sample. Because there were few children who would be considered to have had a low birth weight, this variable also remained continuous.

Although continuous explanatory variables are informative, in some cases, it is useful to create nominal categorical explanatory variables. Although the parenting stress scores had linear relationships to the outcomes, point differences were not easily interpretable since this was a scale created from another measure of parenting stress. There was no reported threshold that indicated high parenting stress, and there was no information on what increases were meaningful. Thus, extreme scorers on this measure (at or above the 75th percentile) were compared to the rest in multivariate analyses.

Mothers' ratings of the adequacy of their social support were not related to the BBCS, although support at the second follow-up was related to the BPI. Social support was retained as a continuous variable during the modeling process in part because there was very little variability on this measure (nearly 75% of respondents rated their support at 8 or higher on a 10-point scale) and little information on what would constitute a meaningful incremental increase.

Depression scores at random assignment, the first and second follow-ups were initially treated as continuous variables. However, of interest was the relationship between maternal depression and child outcomes. Therefore, dichotomous scores cut at 24 (the score indicating currently depressed state) were used. This cut score was at the 73rd percentile at program intake, and the 81st at both follow-ups.

A variable that represented the proportion of the 18 months between random assignment and the first follow-up interview spent in market or paid childcare including daycare centers, preschool, family daycare, or a paid babysitter was computed (Quint et al., 1997). Because the distribution was skewed—with children concentrated in the lower part of the curve, linearity testing required that the variables be divided with fewer than 25% in each group. The proportion of time in market childcare appeared to have a clear breaking point: those in care at least 26% of the time (5 months or more) were significantly less likely to have a low BBCS scores, while those in care less time showed no reduction in risk. There was no relationship between time in care and BPI scores.

The proportions of time in center-based or family daycare were also skewed toward the low end of the distribution. Using quartiles to examine linearity was not possible because of the large proportions of children clustered at zero. For the center-based daycare variable, three groups were used. Having spent at least 25% of the time in daycare was positively associated with BBCS outcome; spending more than 50% of the time was also protective, but not more so. Therefore, a breaking point of 25% or better was adopted. For time spent in family daycare, only a dichotomy could be used because the majority of children had spent very little or no time in this type of care. Thus, this variable was dropped from further analysis, as it was virtually identical to the variable representing any use of family daycare.

Scores on the home environment measure, using the methodology reported in the previous chapter, were examined as both continuous and as dichotomous variables.

While continuous home environment scores were significant explanatory variables for the BBCS, there was no easily interpretable or recommended incremental increase to use. Therefore, dichotomizing home environment scores at the 85th percentile created an overall measure of positive home environment. An indicator of positive home was used environment because this was an indirect way that New Chance hoped to impact child development.

Total hours of employment showed a linear relationship and was weakly related to BBCS score. This variable was examined as both a continuous and a dichotomous measure. The dichotomous measure was cut at the 75th percentile (working 352 hours or more). This averages to working nearly 20 hours per week over the 18 months. However, this variable did not hold up during exploratory model building no matter which form was used.

Theoretical Model Building

Five multivariate theoretically-based models were constructed for each of the outcome measures (referred to as Models 1-5) to test the components of the conceptual model depicted in Figure 1. The same procedure was followed for each response variable. The first model included variables that represented maternal and child background characteristics only. Each subsequent model added variables representing a new domain, as outlined in the conceptual model, retaining variables entered in prior models. Table 11 presents the results for Models 1 – 5 for BBCS scores and Tables 12 and 13 do so for maternal and teacher BPIs, respectively. The models in Table 11 show

Table 11

Theoretically-Based Logistic Regression Models Explaining Poor BBCS Scores

Variable	Odds Ratios				
	Model 1	Model 2	Model 3	Model 4	Model 5
Background					
Black	1.44*	1.38*	1.28	1.19	1.19
Hispanic	1.72**	1.73**	1.64**	1.61**	1.62**
Male child	1.19	1.17	1.16	1.17	1.16
Child age, Wave II (years)	0.93	0.94	0.95	0.94	0.91
TABE grade equivalent	0.92***	0.93**	0.95*	0.94*	0.94*
Highest grade completed	0.82***	0.83***	0.88*	0.90*	0.89*
Mother on welfare > 2 yrs. as child	1.34**	1.34**	1.31**	1.28*	1.26
Maternal Characteristics & Resources					
Depression, Wave II		1.23	1.24	1.22	1.23
High parenting stress, Wave II		1.32*	1.29	1.29	1.29
Below poverty level, Wave II		1.10	1.04	1.00	0.98
Participation in Positive Activity					
Employed at least 33% of time, Wave I			0.85	0.89	0.92
Earned GED/diploma, Wave I			0.65***	0.66**	0.70**
Weeks of education, Wave I			1.00	1.00	1.00
Child-Rearing Environment					
Favorable home environment				0.59**	0.59**
Child care					
Any regular market care by Wave I					1.31
≥ 25% time in paid care by Wave I					0.63**
Began care prior to 1 yr. old					0.79
Likelihood ratio	58.8***	66.8***	79.0***	89.5***	99.8***
df	7	10	13	14	17

Note. n = 1,306. *p < .05, **p < .01, ***p < .001.

Table 12

Theoretically-Based Logistic Regression Models Explaining Poor Maternal BPI Scores

Variable	Odds Ratios				
	Model 1	Model 2	Model 3	Model 4	Model 5
Background					
Black	0.62*	0.49**	0.43***	0.43***	0.43***
Hispanic	0.71	0.66	0.61	0.61	0.62*
Male child	1.32	1.23	1.21	1.21	1.20
Child age, Wave II (years)	0.87	0.89	0.89	0.89	0.91
TABE grade equivalent	0.94*	0.95	0.98	0.98	0.98
Highest grade completed	0.94	0.99	1.06	1.06	1.06
Mother on welfare > 2 yrs. as child	0.96	0.92	0.88	0.88	0.91
Maternal Characteristics & Resources					
Depression, Wave II		2.13***	2.12***	2.12***	2.14***
High parenting stress, Wave II		4.76***	4.74***	4.74***	4.74***
Below poverty level, Wave II		0.93	0.86	0.86	0.87
Participation in Positive Activity					
Employed at least 33% of time, Wave I			0.80	0.80	0.79
Earned GED/diploma, Wave I			0.49**	0.49**	0.45***
Weeks of education, Wave I			1.00	1.00	1.00
Child-Rearing Environment					
Favorable home environment				0.99	0.98
Child care					
Any regular market care by Wave I					0.98
≥ 25% time in paid care by Wave I					1.42
Began care prior to 1 yr. old					1.10
Likelihood ratio	16.1*	125.6***	138.4***	138.4**	144.0***
df	7	10	13	14	17

Note. n = 1,306. *p < .05, **p < .01, ***p < .001.

Table 13

Theoretically-Based Logistic Regression Models Explaining Poor Teacher BPI Scores

Variable	Odds Ratios				
	Model 1	Model 2	Model 3	Model 4	Model 5
Background					
Black	0.94	0.83	0.77	0.73	0.70
Hispanic	0.57	0.55	0.59	0.57	0.63
Male child	3.01***	2.80***	2.91***	3.00***	3.01***
Child age, Wave II (years)	1.42**	1.44**	1.44**	1.42**	1.45**
TABE grade equivalent	0.90*	0.91	0.91	0.91	0.90*
Highest grade completed	1.19	1.22	1.26	1.27	1.26
Mother on welfare > 2 yrs. as child	1.34	1.26	1.27	1.23	1.35
Maternal Characteristics & Resources					
Depression, Wave II		0.99	0.99	0.99	1.07
High parenting stress, Wave II		1.96*	1.98*	0.92*	1.87*
Below poverty level, Wave II		1.37	1.52	1.49	1.60
Participation in Positive Activity					
Employed at least 33% of time, Wave I			1.92	2.08*	2.23*
Earned GED/diploma, Wave I			0.81	0.82	0.76
Weeks of education, Wave I			0.99	0.99	0.99*
Child-Rearing Environment					
Favorable home environment				0.53	0.50
Child care					
Any regular market care by Wave I					2.12
≥ 25% time in paid care by Wave I					1.05
Began care prior to 1 yr. old					1.47
Likelihood ratio	35.9***	43.3***	49.7***	52.2***	60.6***
df	7	10	13	14	17

Note. *n* = 511. **p* < .05, ***p* < .01, ****p* < .001.

that while background characteristics are important to BBCS scores, other domains are also important. Earning a high school credential was associated with a 30% decrease in risk of low BBCS scores even after controlling for background characteristics and the other domains. Favorable home environment was associated with a 41% decrease in risk. There was no relationship between maternal financial or psychological well being and school readiness scores. While there was no effect noted for using paid care nor starting care early, spending more than 25% of the time in paid care was associated with a 32% decrease in risk of poor BBCS score.

Conversely, Table 12 shows that maternal characteristics and resources, particularly those that represent psychological well being, were the strongest predictors of behavior problems in this sample. Mothers with high parenting stress were nearly five times more likely to rate their children's behavior poorly, and those who were depressed were more than twice as likely. Education and work experience were not related to maternal behavior ratings, although earning a high school credential was associated with a 55% decrease in the risk of poor maternal ratings. The only background characteristic that predicted behavior status was race (Black only), which served as a protective factor. Black children were 57% less likely to have poor maternal BPI ratings than White children were. There was no difference between Hispanic children and White children. Likewise, there was no support for the roles of the child-rearing environment or experience in childcare affecting behavioral outcome once other domains have been controlled.

This picture changes markedly for teacher ratings of behavior. There is still support for maternal parenting stress as a risk factor for poor behavior ratings. Children whose mothers had high parenting stress were nearly twice as likely to receive poor behavior ratings from their teachers. Other risk factors, in order of importance, were male gender, having a mother employed more than 6 of the previous 18 months, and years of age. Male children were three times more likely to receive poor teacher ratings of their behavior and those with mothers who were employed for at least 6 of the previous 18 months were over twice as likely. For all children, the risk of poor behavior increased markedly with age (45% for each year). Two protective factors were noted, both concerning maternal education. For each grade level increase in mothers' TABE reading scores at program intake, risk of poor teacher behavior ratings fell by 10%. Similarly, for each week of education mothers completed between intake and the first follow-up, risk of poor teacher behavior ratings fell by 1%.

Exploratory Model Building

The goal of the exploratory modeling was to better understand whether there were subgroups of children at particularly high risk for poor outcomes within the sample of children born to teen mothers. Exploratory models were built for each outcome using the recommendations of Hosmer and Lemeshow (1989). In brief, they recommended a model building procedure beginning with preliminary univariate logistic models to examine the potential contribution of each explanatory variable. Those that sufficiently improved the models were retained and allowed the chance to enter a multivariate model.

Important control variables were recommended for inclusion regardless of their significance.

In the exploratory models, core control variables (i.e., race/ethnicity, child age, and gender) were included regardless of their performance. Excepting for the core control variables, only explanatory variables that significantly improved the Global Score statistic were allowed to enter the equations. Modeling for the BBCS and both BPIs followed identical procedures using the index sample. Each model was validated by applying the solution to the reserve sample.

The multivariate exploratory model explaining BBCS scores is shown in Table 14. This model had a significant Score statistic (32.9 with 7 degrees of freedom, $p < .001$). It correctly explained 59.9% of the observed responses and had a non-significant goodness of fit statistic (5.8 with 8 degrees of freedom, $p = .67$), indicating a good fit. The goodness of fit statistic, developed by Hosmer and Lemeshow, involves dividing the sample into deciles based on predicted risk. Chi-square tests evaluate observed and expected numbers of subjects in the deciles. A non-significant value is an indication of adequate model fit (Stokes et al., 1995).

The model in Table 14 shows that history of maternal welfare receipt when she was a child was a risk factor for poor BBCS scores. Spending at least 2 years on welfare was associated with a 75% increase in risk of low BBCS score. Home environment and earning a high school credential were protective factors. Favorable home environment was associated with a 47% reduction in risk, while having a mother who earned a high

Table 14

Exploratory Model Explaining Poor Performance on the BBCS

	Variable	Odds Ratio
	Intercept	--
	Black	1.16
Control variables	Hispanic	1.14
	Male child	1.39
	Child age, Wave II	0.88
	Mother on welfare ≥ 2yrs as child	1.76*
Test variables	Favorable home environment	0.53*
	Earned GED/diploma by Wave I	0.49**
Likelihood ratio		33.6
df		7

Note. Sample size was n = 985. This was a random sample of children from the full analysis sample. The remaining children were reserved as a validation sample.

$*p < .05$, $**p < .01$.

school credential by the first follow-up was associated with a 51% decreased risk for low BBCS scores.

Interaction terms of interest for the BBCS were examined last. These were the relationships between race/ethnicity and home environment score, between race/ethnicity and child's gender, and between starting care before 1 year of age and child's gender. None of these interaction terms added predictive power to the model, and none were included in the multivariate model (not shown in table).

Model building procedures for maternal and teacher BPIs followed the same pattern. The exploratory multivariate model predicting poor outcome on the BPI had a significant Score statistic (145.3, with 10 degrees of freedom, $p < .001$), and a non-significant goodness of fit statistic of 4.1 with 8 degrees of freedom, $p = .85$. The model correctly explained 71.5% of observed responses. The results of this multivariate model are shown in Table 15.

Maternal psychological state was a significant risk factor for poor behavior ratings in children. Maternal depression upon program entry resulted in 76% increased risk for poor behavior ratings, while maternal depression at the second follow-up represented a 79% increase. High parenting stress at the first follow-up was associated with a 109% increased in risk while, high parenting stress at the second follow-up resulted in a 260% increase in risk of poor behavior ratings.

Race/ethnicity was a protective factor for behavior problems. Black children were 61% less likely to have poor behavior ratings than Whites. Hispanic children did

Table 15

Exploratory Model Explaining Problem Behavior on Maternal-Rated BPIs

	Variable	Odds Ratio
Control variables	Intercept	--
	Black	0.39***
	Hispanic	0.60
	Male child	1.15
	Child age, Wave II (years)	0.88
Test variables	Depression, random assignment	1.76*
	Depression, Wave II	1.79*
	High parenting stress, Wave I	2.09**
	High parenting stress, Wave II	3.60***
	Earned GED/diploma, Wave I	0.54*
	Mother in good health, Wave I	0.60*
Likelihood ratio		132.8
df		10

Note. Sample size was n = 936. This was a random sample of children from the full analysis sample. The remaining children were reserved as a validation sample.

*p < .05, **p < .01, ***p < .001

not differ compared to White children. Having a mother who completed a high school degree by the first follow-up was associated with a 46% decrease in risk of poor behavior ratings. Mothers who reported they were in good physical health at the first follow-up were 40% less likely to give their children poor behavior ratings.

Several interaction terms were also tested for this model. They were the relationship between race/ethnicity and depression (at both random assignment and the second follow-up), the relationships between male child and high parenting stress, between depression and stress, and between male child and depression at random assignment. None of these was significant. An interaction term for male child x depression at the second follow-up was significant, and when entered into the model made the main effects for male child and depression at the second follow-up non-significant. However, the sum of the odds for the main effects variables (in a model without the interaction) was much larger than the odds for the interaction term (4.75 vs. 2.49 respectively). Therefore, the main effects model was preferred (P. A. McDermott, personal communication, March 10, 1999).

The exploratory model explaining teacher ratings of behavior is shown in Table 16. This model was significant with a Score statistic of 18.5 and 4 degrees of freedom, $p < .01$. The goodness of fit statistic was non-significant, 9.5 and 8 degrees of freedom, $p = .40$. It correctly explained 55.6% of responses. No variables aside from the core control variables entered the equation. The predictors of poor teacher ratings were child gender,

Table 16

Exploratory Model Explaining Problem Behavior on Teacher-Rated BPIs

	Variable	Odds Ratio
	Intercept	--
	Black	1.04
Test variables	Hispanic	0.75
	Male child	2.53**
	Child age, Wave II (years)	1.39*
Likelihood ratio		16.8**
df		4

Note. n = 376. *p < .05, **p < .01, ***p < .001

with males at more than two and a half times higher risk than females and child age, with each year increase in age associated with 39% increase in risk.

Application of Multivariate Models to the Validation Sample

To validate the exploratory multivariate models described above, the solutions for the BBCS and maternal BPI were applied a random sample of 321 children (the validation sample). Although informative, these analyses are likely to have lower power due to the smaller sample sizes used. The teacher BPIs were not validated because there were too few children with these scores in the validation sample, making cell sizes very small.

The solution from the BBCS exploratory model applied to the validation sample resulted in a model with a significant Score statistic (22.4 with 7 degrees of freedom, $p < .01$) that correctly explained 59.2% of observations. This was just 0.7% lower than the solution for the larger index sample. The variables that were most powerful in predicting poor scoring on the BBCS in the validation sample were Hispanic ethnicity (a risk factor), favorable home environment, and having a mother who earned a high school degree (both protective factors). Hispanic ethnicity was not a significant predictor in the original model.

The same procedure was followed for maternal BPI scores. The exploratory maternal BPI solution applied to the validation sample resulted in a model with a significant Score statistic (21.4 and 10 degrees of freedom, $p < .05$) that correctly explained 58.2% of the observed responses. This was 13% less than the model explained for the larger index sample, an indication of decreased precision. The only significant predictor for this sample was high maternal stress at the second follow-up (a risk factor). These analyses indicated that the exploratory maternal BPI model was not as stable as the exploratory BBCS model and results should be interpreted with caution.

Subordinate Hypothesis-Testing Models

Subordinate hypotheses about the actions of particular explanatory variables were tested with a series of logistic regression equations using the analysis sample. Since conclusions about the actions of individual variables could be determined from their performance in the theoretically-based models, to avoid redundancy, only variables that were not used in the theoretical models were included here. Table 17 displays the results for the BBCS and Tables 18 and 19 do so for maternal and teacher BPIs respectively. In each case, the odds ratios for univariate equations are reported first, followed by the odds controlling for traditionally-used biological factors (race/ethnicity, child age, and gender). Finally, the odds ratios for the particular explanatory variables are presented controlling for biological and social factors (in addition to the biological factors above: maternal education, history of welfare receipt as a child, and whether income was below the poverty line at the second follow-up). Hypotheses were considered to be confirmed when the simple relationships held after controlling for both biological and social factors. In most cases, the hypothesized relationship to the outcome was rejected, this was usually the result of no relationship, or a relationships that did not hold up in equations with control variables, rather than one contrary to expectations. Only in the case of birth

Table 17

Hypothesis Testing of Explanatory Variables for Poor Outcome on the BBCS

Hypothesis	Odds Ratios			Accept/Reject Hypothesis
		Controlling Background		
	Univariate	Biological only[a]	Biological & Social[b]	
1. Employment prior to enrollment will be a protective factor against low BBCS scores.	0.83	0.94	1.01	Reject
2. Heavier birth weight will be a protective factor for low BBCS scores (per 1lb increases).	0.91*	0.91*	0.91*	Accept
3. First born status will be a risk factor for low BBCS scores.	0.68*	0.67*	0.71*	Reject
4. Good maternal health[c] will be a protective factor for low BBCS scores.	0.85	0.83	0.84	Reject
5. Increasing maternal satisfaction with social support[c] will be a protective factor for low BBCS scores.	0.93*	0.93**	0.93*	Accept
6. Stopping welfare receipt for 3 months[c] or more will be a protective factor for low BBCS score.	0.80	0.84	0.95	Reject

(Table 17 continued next page)

(Table 17 continued)

Hypothesis	Odds Ratios			
		Controlling Background		
	Univariate	Biological only [a]	Biological & Social [b]	Accept/Reject Hypothesis
7. Living in a household without adults [c] (aside from the mother) will be a risk factor for low BBCS score.	1.39*	1.28*	1.27	Reject
8. Greater stability in daycare [d] (fewer arrangements) will be a protective factor against low BBCS scores.	0.93	0.95	0.98	Reject
9. Increasing hours worked [c] will be a protective factor for low BBCS scores. (At least 352 hours by the first follow-up)	0.72*	0.79	0.87	Reject

Note. n = 1,306. $*p < .05$, $**p < .01$, $***p < .001$. [a] Biological factors = race/ethnicity, child gender, and child age. [b] Social factors = highest grade completed prior to program entry, more than 2 years welfare when mother was a child, and income below poverty level. [c] Measured at the second follow-up. [d] Measured at the first follow-up.

Table 18

Hypothesis Testing of Explanatory Variables for Poor Behavior on Maternal BPIs

	Odds Ratios			
		Controlling Background		
Hypothesis	Univariate	Biological only [a]	Biological & Social [b]	Accept/Reject Hypothesis
1. Employment prior to enrollment will be a protective factor against low maternal BPI scores.	1.10	1.25	1.32	Reject
2. Heavier birth weight will be a protective factor for low maternal BPI scores (per 1lb increases).	1.05	1.02	1.02	Reject
3. First born status will be a risk factor for low maternal BPI scores.	0.89	0.85	0.89	Reject
4. Good maternal health [c] will be a protective factor for low maternal BPI scores.	0.61**	0.63**	0.63**	Accept
5. Increasing maternal satisfaction with social support [c] will be a protective factor for low maternal BPI scores.	0.89**	0.90**	0.91**	Accept
6. Stopping welfare receipt for 3 months [c] or more will be a protective factor for low maternal BPI score.	1.24	1.19	1.31	Reject

(Table 18 continued next page)

(Table 18 continued)

	Odds Ratios			
		Controlling Background		
Hypothesis	Univariate	Biological only [a]	Biological & Social [b]	Accept/Reject Hypothesis
7. Living in a household without adults [c] (aside from the mother) will be a risk factor for low maternal BPI score.	0.86	1.01	0.98	Reject
8. Greater stability in daycare [d] (fewer arrangements) will be a protective factor against low maternal BPI scores.	1.01	1.06	1.08	Reject
9. Increasing hours worked [c] will be a protective factor for low maternal BPI scores. (At least 352 hours by the first follow-up)	0.77	0.82	0.86	Reject

Note. $n = 1{,}306$. *$p < .05$, **$p < .01$, ***$p < .001$. [a] Genetic factors = race/ethnicity, child gender, and child age. [b] Social (sociodemographic) factors = highest grade completed prior to program entry, more than 2 years welfare when mother was a child, and income below poverty level. [c] Measured at the second follow-up. [d] Measured at the first follow-up.

Table 19

Hypothesis Testing of Explanatory Variables for Poor Behavior on Teacher BPIs

	Odds Ratios			
		Controlling Background		
Hypothesis	Univariate	Biological only [a]	Biological & Social [b]	Accept/Reject Hypothesis
1. Employment prior to enrollment will be a protective factor against low teacher BPI scores.	0.83	0.79	0.76	Reject
2. Heavier birth weights will be a protective factor for low teacher BPI scores (per 1lb increase).	1.07	1.04	1.06	Reject
3. First born status will be a risk factor for low teacher BPI scores.	1.53	1.70	0.66	Reject
4. Good maternal health [c] will be a protective factor for low teacher BPI scores.	0.64	0.73	0.72	Reject
5. Increasing maternal satisfaction with social support [c] will be a protective factor for low teacher BPI scores.	0.95	0.98	0.98	Reject
6. Stopping welfare receipt for 3 months [c] or more will be a protective factor for low teacher BPI score.	0.85	0.91	1.08	Reject

(Table 19 continued next page)

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(Table 19 continued)

	Odds Ratios			
		Controlling Background		
Hypothesis	Univariate	Biological only [a]	Biological & Social [b]	Accept/Reject Hypothesis
7. Living in a household without adults [c] (aside from the mother) will be a risk factor for low teacher BPI score.	1.48**	1.50**	1.45**	Accept
8. Greater stability in daycare [d] (fewer arrangements) will be a protective factor against low teacher BPI scores.	1.20	1.15	1.16	Reject
9. Increasing hours worked [c] will be a protective factor for low teacher BPI scores. (At least 352 hours by the first follow-up)	0.88	1.28*	1.39	Reject

Note. n = 511. $*p < .05$, $**p < .01$, $***p < .001$. [a] Genetic factors = race/ethnicity, child gender, and child age. [b] Social (sociodemographic) factors = highest grade completed prior to program entry, more than 2 years welfare when mother was a child, and income below poverty level. [c] Measured at the second follow-up. [d] Measured at the first follow-up.

order, in which first born status was hypothesized to be a risk factor, did it instead act as a protective factor (for BBCS scores only).

Childcare x Age Interactions

Because an examination of the developmental effects of exposure to childcare was one of the primary aims of this project, these relationships were analyzed more fully. In the analysis sample, children's ages at program intake ranged from newborn to 4 years old. Because of the age span, and because often childcare patterns are correlated with age, age x duration of care variables were examined for the BBCS and maternal BPIs. These analyses allow inferences about whether longer duration of different types of care was equally beneficial for children of all ages. Three categories of age at program intake were constructed: less than 1 year old, between 1 and 2 years, and 3 through 4 years of age. These three categories were interacted with each of the three dichotomous time-in-care variables: time in any market care, time in center-based daycare, and any family daycare. The following control variables were used: race/ethnicity, child age, gender, highest grade mother completed, maternal TABE grade equivalent, maternal welfare history as a child, and experimental group status. Experimental group status was included, because this was related to use of daycare in the early months of New Chance (Quint et al., 1997). Tables 20 and 21 present results for the BBCS and maternal BPI respectively (cell sizes became too small to conduct a parallel analysis using teacher BPI scores as the outcome measure).

Table 20 shows that there was no effect of extended time in market (paid) care

Table 20

Effects of Daycare Duration and Age Interactions on Poor BBCS Scores

Explanatory variables	Odds Ratios
Model 1: Any Market Care	
> 25% time in market care x age less than 1	0.92
> 25% time in market care x age 1 to 2	1.13
> 25% time in market care x age 3 to 4	0.83
Model 2: Daycare Center	
≥ 25% time in daycare center x age less than 1	0.66**
≥ 25% time in daycare center x age 1 to 2	0.92
≥ 25% time in daycare center x age 3 to 4	0.81
Model 3: Family Daycare	
Used family daycare x age less than 1	0.70
Used family daycare x age 1 to 2	0.76
Used family daycare x age 3 to 4	0.98

Note. n = 1,306. Explanatory variables in the models included race/ethnicity, gender, highest grade mother completed, TABE grade equivalent, welfare history, experimental group status. Each model also contained main effect terms for the particular type of daycare and for extended use of that type of care.

*$p < .05$, ** $p < .01$, *** $p < .001$.

Table 21

Effects of Daycare Duration and Age Interactions on Poor Maternal BPI Scores

Explanatory variables	Odds Ratios
Model 1: Any Market Care	
> 25% time in market care x age less than 1	0.97
> 25% time in market care x age 1 to 2	0.98
> 25% time in market care x age 3 to 4	1.01
Model 2: Daycare Center	
≥ 25% time in daycare center x age less than 1	1.13
≥ 25% time in daycare center x age 1 to 2	1.29
≥ 25% time in daycare center x age 3 to 4	1.83*
Model 3: Family Daycare	
Used family daycare x age less than 1	0.31
Used family daycare x age 1 to 2	0.30
Used family daycare x age 3 to 4	0.57

Note. n = 1,306. Explanatory variables in the models included race/ethnicity, gender, highest grade mother completed, TABE grade equivalent, welfare history, experimental group status. Each model also contained main effect terms for the particular type of daycare and for extended use of that type of care.

*$p < .05$, ** $p < .01$, *** $p < .001$.

within any of the subgroups. Odds ratios were computed based on weighted combinations of interaction terms and indicated that there was no age x dose effect of market care.

For use of center-based daycare, children in the youngest age group who used the most care were at lower risk for poor cognitive development than young children who did not use center-based care, or used it at a lower intensity ($p < .01$). There were no effects noted any of the family daycare interaction terms. For maternal BPIs, the only significant effect was noted for the oldest children (aged 3-4) who used the most center-based care. These children were at an increased risk for poor maternal behavior ratings ($p < .05$).

Post-Hoc Power Analysis

Post hoc power analyses were conducted to assess the probability that effects, if there, would have been found. Assuming a moderately small effect size of .15 and an alpha level of .05, power analysis software (GPower; Faul & Erdfelder, 1992) was used to compute power for univariate and multivariate exploratory and theoretically-based models of the BBCS, and both maternal and teacher BPIs. For the BBCS and maternal BPI equations, sample size was sufficiently large that power was well over the usual .80 benchmark for all models. The teacher BPI equations were more problematic. Because of smaller sample size, power for all but the univariate teacher BPI equations was much lower than had been hoped (see Table 22). These results indicate that moderately small effects were likely to be detected for the BBCS and maternal BPIs. The possibility of Type II error rose substantially when considering multivariate teacher BPI models.

Table 22

Post Hoc Power Analyses

Model	df	Sample size	Power (ES=.15)
Univariate Models of BBCS/Maternal BPI	1	985	.997
Univariate Models of Teacher BPI	1	394	.847
Exploratory BBCS Model	7	985	.953
Exploratory Maternal BPI Model	9	944	.912
Exploratory Teacher BPI Model	5	394	.656
Theoretical Models of BBCS/Maternal BPI		1,306	
Model 1	7		.990
Model 2	10		.981
Model 3	13		.970
Model 4	14		.966
Model 5	17		.952
Theoretical Models of Teacher BPI		511	
Model 1	7		.688
Model 2	10		.616
Model 3	13		.560
Model 4	14		.545
Model 5	17		.502

Note. Assumes an alpha level of .05 in all cases. ES = Effect size or Cohen's d. Power calculated with GPower (Faul & Erdfelder, 1992).

CHAPTER 5

DISCUSSION

The preceding chapter presented the results of both theoretically-based and exploratory models of cognitive and behavioral development in a sample of children born to teen mothers. This chapter will expand upon the results and discuss the findings in terms of the extant literature, implications for future programs and policy, and directions for future research. Other sections will compare linear regression and logistic regression models (see Appendix B), and discuss the limitations of the study.

School Readiness Models

A measure of school readiness was used here as a proxy for cognitive development. Of primary interest was how factors that were emphasized in the New Chance intervention (and in similar programs) were related to cognitive development, controlling for background characteristics. The theoretically-based models showed that favorable home environment was an important protective factor, as was having a mother who earned a high school credential during the study period. These results have been found repeatedly in the literature (e.g., Berlin, Brooks-Gunn, Spiker, & Zaslow, 1995; Bradley, 1994).

There was no effect for early entry or use of market childcare in the theoretical models. However, increasing duration of time spent in market care was a protective factor for cognitive development.

Extended exposure to center-based childcare was a strong protective factor for cognitive development in the youngest children. These children were at substantially decreased risk compared to younger children who did not use center-based care. This result is encouraging given that welfare reforms will require even mothers with very young children to find employment, and consequently childcare for their children. There were no effects of family daycare on cognitive development, although this may be a result of the relatively low usage in this sample.

Otherwise, the theoretical models highlighted the importance of maternal education on children's cognitive development. Even small differences—one grade equivalent in mothers' reading level, or one year of additional schooling at program intake—were associated with substantial reductions in risk of poor BBCS scores. There were no consistent effects of race/ethnicity on cognitive development. Hispanic ethnicity was a risk effect in the theoretically-based models, although not in the exploratory model.

School readiness was not related to transient "state" characteristics such as mothers' physical health and emotional well being. It is possible that these state qualities (rather than more stable traits) are less able to impact performance on an instrument like the BBCS that taps cumulative knowledge of concepts.

The exploratory BBCS model largely replicated the results of the theoretically-based models. These models were built to investigate high-risk subgroups in the sample. However, after controlling for race/ethnicity, child age, and sex, only variables denoting favorable home environment, mother earning a high school credential, and history of welfare receipt as a child entered the equation. The importance of maternal history of welfare receipt as a child as a risk factor for school readiness was a difference between the models. The negative impact of a history of welfare receipt provides evidence for the adverse intergenerational effects of poverty, and possibly for welfare receipt itself. It also demonstrates that even within a group specifically selected for similar adverse characteristics and circumstances, there were subgroups at increased risk for especially adverse cognitive outcomes.

Behavioral development

In contrast to cognitive development, mothers' emotional and psychological well being strongly predicted children's behavior ratings. Perhaps this is to be expected, since mothers completed behavior ratings of their own children. In fact, the depression-distortion hypothesis posits that the behavior disturbances noted in children of depressed mothers is the result of distorted maternal perceptions rather than true behavioral differences (Richters & Pellegrini, 1989). To the extent this is true, the behavior ratings may tell us more about the mothers than it tells us about their children.

The theoretically-based and exploratory models showed that aside from depression and parenting stress, only race/ethnicity (minority status), and earning a high school diploma were able to predict ratings, both acting as protective factors. The strong effects of maternal depression, parenting stress, and race call the validity of these ratings into question. Others have found that Blacks were at increased risk for poor behavior scores on maternally-rated instruments (e.g., versions of the Child Behavior Checklist), although this effect was thought to be largely due to the effect of living in a female-headed household (Duncan, Brooks-Gunn, & Klebanov, 1994). Perhaps there were cultural differences in maternal perceptions of behavior, or the behaviors included in the instrument were less important to minority mothers.

Examination , both through direct comparisons and through modeling to predict them of teachers' ratings for a subsample of children, indicated that there was little correspondence between mother and teacher ratings. This finding is not without precedent (e.g., Keller, 1988), and could have been the result of a number of factors. Poor instrument reliability, or poor reliability of mothers as raters, potentially the result of literacy problems could have produced these effects. The fact that race and depression variables did not predict teacher ratings, lends some credence to this explanation. Alternatively, children may have behaved differently in the contexts in which the ratings were completed (home versus school).

In contrast to maternal behavior ratings, both the theoretically-based and exploratory models of teacher ratings showed that child sex (male) and age were the most important predictors, both acting as risk factors. Children whose mothers were employed for the longest duration were also at increased risk for poor teacher ratings, as were those whose mothers reported high parenting stress. The significance of the parenting stress variable in predicting teacher ratings lends support to the validity of parenting stress as a predictor of poor behavior. Otherwise, children who were rated as having behavior problems by their teachers did not appear markedly different from other children in the sample. They were slightly older (mean age was 5.7 vs. 5.1 years), but their mothers were similar in their levels of stress and depression as the rest of the sample.

This finding does not establish the direction of influence (do highly stressed mothers parent incompetently, leading to poor behavior in their children, or do children act out and cause their mothers high parenting stress?). It is possible that there is a more complex, possibly reciprocal relationship between child behavior and mothers' emotional state. This would be consistent with previous research that found the presence of a depressed parent was associated with negative mother-child interactions and otherwise disrupted familial dynamics, even extending to interactions between the child and the non-depressed parent (Jacob & Johnson, 1997).

There was no relationship between the home environment and use of childcare on either mother or teacher behavior ratings. Previous research has found that HOME-SF subscales predicted BPI scores, albeit rather weakly (Sugland et al., 1995). It is possible that the positive relationship between HOME (and HOME-SF) scores and income previously reported (Bradley, 1994; Duncan et al., 1994; Procidano, 1985) may have limited the ability of this score to differentiate among relatively disadvantaged populations on a behavioral outcome. It is also quite likely that the altered form of the HOME-SF used here may account for the lack of predictive power (discussed further in the study limitation section below).

The effect of non-maternal childcare is the subject of an extensive literature that has generally found that low income and poor children can benefit from high quality care (e.g., Helburn & Howes, 1996). Others found that non-maternal childcare within the first year of life was detrimental to children's BPI scores (Baydar & Brooks-Gunn, 1991). However, the type and timing of childcare generally were unrelated to ratings of behavior problems for children in this sample. Yet, children who were the oldest at program intake and who had the most exposure to center-based care were at increased risk of poor maternal behavior ratings. It is not clear why older children would experience negative effects from center-based care. The effect may have been related to their developmental stage, or perhaps to a combination of developmental demands and maternal-child dynamics.

Comparisons of Logistic and Linear Regression Models

Appendix B presents results of linear regression using each outcome to replicate the most comprehensive of the theoretically-based models (Model 5 for each outcome). These analyses were completed to examine differences that might result from using a continuous versus a dichotomous outcome. Although direct comparison of the models is not easy because they are operating on different metrics (i.e., logistic models use chi-square statistics and create contingency tables, while linear regression uses $\underline{F}$ ratios and fits predicted values of the outcome to a line), inspection of significant explanatory variables across the sets of linear and logistic models was used to draw conclusions about the efficacy of each type of model. In addition, a set of comparison statistics was calculated based on correlation coefficients derived from each model (i.e., the $\underline{R}$ versus the ratio of the phi coefficient to its maximum). While this is not a commonly used comparison, it served as way to achieve a common metric and make general comparisons between models.

For the BBCS and maternal BPI ratings, linear models resulted in more parameters reaching statistical significance. In the case of the BBCS, the R compared to the ratio of the phi to its maximum was also larger, although not extremely so. However, for the maternal BPI, two parameters that were significant predictors in the logistic models were not significant in the linear model and the value of the R was smaller than the ratio of the phi to its maximum. Similarly, teacher BPI models using linear regression compared less favorably to the logistic models, this time with fewer significant parameters and a smaller R compared to the phi ratio. These results are not easily interpretable and the best conclusion might be to allow the readers to chose the model they find most informative.

Implications for Future Programs and Public Policy

The varied results of single generation programs for teenaged mothers have been described extensively (e.g., Boruch, 1998; Maynard, 1995). Less well documented have been the effects of two-generation programs, although a recent review noted generally minimal impacts on child development (St. Pierre et al., 1995). This project was an attempt to add to our knowledge about the feasibility of improving children's outcomes through such programs. Accordingly, the findings reported here have implications for both policy and future program development. This study showed that some children from poor circumstances can benefit from experience in childcare. There were either positive or null effects on cognitive development with extended exposure to care. Maternal behavior ratings were generally unrelated to exposure to care, except for a subgroup of older children using the most center-based care. For the most part, this is consistent with much of the literature that has found benefits (primarily cognitive) for low-income children who participated in childcare (e.g., Caughy et al., 1994; Zaslow et al., 1997). Benefits may accrue to poor children due to the relative stimulation provided in the care setting versus that available in the home (Caughy et al., 1994). Economically advantaged children are more likely to experience somewhat diminished learning environments in childcare compared to that available at home while poor children are more likely to encounter increased opportunities for learning than they would otherwise. Exposure to childcare could be one way to help less advantaged children developmentally catch up with their peers, as was the intention of the New Chance program, especially if the childcare was substantial and of high quality.

Maternal employment, neither duration nor hours worked, was detrimental to school readiness and not related to mothers' behavior ratings. It seems that employment did not affect mothers' relationships with or perceptions of their children (as evidenced by their behavior ratings), a finding that lends support to current welfare policies that require mothers to work for their benefits. However, the negative association between maternal employment and teacher ratings of behavior is cause for some concern. Longer spells of employment may leave too little parent-child time, resulting in acting out behavior in the school setting. It is difficult to draw firm conclusions about maternal employment since these data were collected prior to recent welfare reform efforts. In this sample, women who worked were able to self-select into employment, it is not certain that the same results would be found when work is required of all welfare recipients.

Although weeks of education were not related to BBCS or mother ratings of behavior, there was a positive association between weeks of education and teacher BPIs. Just one week of maternal education was associated with a 1% decrease in risk of poor ratings. In addition, earning a high school credential was a strong protective factor for both school readiness and maternal behavior ratings. Clearly, continued programmatic emphasis on education for young mothers is warranted.

Future programs also should pay close attention to maternal depression and stress given the high levels reported in this sample. Clearly, the life circumstances of many poor teenaged mothers place emotional burdens on these young women. Program developers should factor in an awareness of this group's apparent propensity for depression and incorporate program features to ameliorate the problems to ensure that the program has intended impacts (e.g., on employment, education, and child development). Options might be to improve screening for stress and depression, facilitate access to treatment, and provide respite childcare when needed. This is particularly important in light of the finding that depression and parenting stress predicted poor behavior in children.

The adverse effects of extended history of welfare receipt on children's cognitive development also has policy implications. Unfortunately, only family history of welfare receipt was collected at program intake, not other indices of poverty (i.e., low-income but not receiving welfare). Without more information on the poverty status of the mothers' families of origin, conclusions can only be made about intergenerational transfers of poverty, rather than of the effects of dependence on welfare. Previous research has found little difference in development among poor children from welfare-receiving families compared to poor children without welfare (Zill et al., 1995). However, it is clear that even within a specified group (e.g., teenaged mothers on welfare) there are subgroups that are at even higher risk and that will be more difficult to reach programmatically.

Study Limitations

Generalizations about study findings are predicated on an awareness of the study limitations. First, the New Chance sample was neither nationally nor locally representative and, because the program was voluntary, it is possible that New Chance applicants differed from other young women in similar circumstances. Therefore, inferences about the generalizability of the findings should be made cautiously. In addition, although the New Chance program employed random assignment to treatment and control conditions, the analyses reported in this paper pooled the two treatment groups. While the original analysts could conclude that observed differences between groups were the result of the program, such causal statements cannot be made here.

Although the conceptual model indicated that the presumed pathways of influence were from parent to child (through various mediating constructs), it is possible that children played an active role in influencing some of these constructs rather than being passive recipients of the effects. It is, however, possible to say that, with background characteristics controlled, there was clear benefit of favorable home environment and maternal education for children's cognitive development.

Another limitation was study instrumentation, the BPI in particular. The instrument has not been normed and reliability and validity have not been well documented. Maternally-rated BPIs were the most problematic. Although it had been used in New Chance with six subscales, the internal consistency of maternal subscale scores was well below recommended minimum levels. Possibly because the items tapping internalizing were less discriminating or less well represented, only two reliable and invariant subscales were found in the subsequent scaling work (an internalizing and an externalizing factor—"Peer Difficulties" and "Misbehavior," respectively). Unfortunately, the internalizing factor did not show high enough specificity for use as a separate outcome measure.

Although reliability of the BPI has been acceptable in other samples (e.g., the NLSY; Mott & Quinlan, 1991), there has been little done to establish its content, criterion, or construct validity. There was some evidence that the BPI had low or negative correlations with measures of achievement in the NLSY (presuming that poor behavior impedes children's learning) (Mott & Quinlan, 1991). In addition, in New

Chance there was evidence that children who had had a tantrum during the survey received more negative behavior ratings from both mothers and teachers. This was however, quite a small group and does not replace systematic validation. Further research to establish content, criterion, and construct validity of the BPI would help to illuminate its utility as a measure of behavior problems.

The HOME-SF as used in New Chance was not as useful as it might have been due to changes in the content and scoring. These changes were the result of low reliabilities of the instrument used at the first follow-up. While the changes between first and second follow-up improved the reliabilities of the HOME-SF subscales, they also changed the instrument. This potentially affected the operation of existing items and subsequently, different forms could not be assumed to measure the same constructs (Standards for Educational and Psychological Testing, 1985).

The items that made up the new home environment score as used here were primarily observer ratings of maternal and child interactions and the organization and cleanliness of the home environment, and did not cover a broad range of parenting behaviors. However, despite the limitations of the new score, the fact that higher scores predicted better academic readiness provides some support for its use in this context. The lack of a relationship between home environment scores and the behavioral outcomes could reflect the fact that the original HOME-SF was originally developed to identify children at risk of later intellectual problems (Procidano, 1985). In addition, even the original HOME-SF has shown only moderate relationships with behavior (e.g., Sugland et al., 1995).

The criticisms of some of the measures used in New Chance are made with an awareness of the tensions that exist when trying to balance study quality and study cost. Also, in some cases better measures may not exist or may be too time consuming or otherwise inappropriate for use with a particular sample. Generally, it is easier (and often more informative) to develop scales for broad populations rather than the tails of the distribution.

Directions for Future Research

The results of this study have implications for future research. One step would be to substantially repeat these analyses with a nationally or regionally representative sample of young mothers. This would begin to answer questions about the generalizability of the findings and it would help to disentangle the effects of recent welfare reform policies on children.

Collecting detailed information on the quality of childcare and the time typically spent there per week would allow further examination of the influences of childcare on children's development. Further information on specific parenting behaviors and time spent on them in addition to information on parenting styles would help to clarify important mediators of maternal characteristics.

Finally, while this project did not consider the effects of paternal influences on children, this is clearly an important area for future research. Examination of various types of father involvement and their relationships to child development could help clarify the importance of fathers and encourage this to be a focus of future programs.

Overall, it is hoped that the findings presented here can add to our knowledge of the influences on children's development and help in the design of programs for teenaged mothers and their children.

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APPENDIX A

REVIEW OF THE NEW CHANCE CHILD OUTCOME MEASURES

Bracken Basic Concept Scale

Children's cognitive functioning was assessed at the second follow-up using the School Readiness Component (SRC) of the Bracken Basic Concept Scale (BBCS). The better-known Peabody Picture Vocabulary Test-Revised (PPVT-R) had been the original choice to measure cognitive development in New Chance (Polit, 1996; Quint et al., 1997). The BBCS was substituted for the PPVT-R because it was judged a better measure of school readiness, less culturally biased, and easier to administer. The SRC was used in preference to the full BBCS because it required less administration time.

The BBCS is an individually administered test that is meant to measure basic concept acquisition in preschool children. Stimulus cards consisting of four or more line drawings illustrate basic concepts; each card has one correct response and three or more distractors (Rhyner & Bracken, 1988). Examiners ask the children to indicate (either by pointing or with a verbal response) which drawing depicts each tested concept. The full BBCS has 11 subtests: color, letter identification, numbers/counting, comparisons, shapes, direction/position, social/emotional, size, texture/material, quantity, and time/sequence. The first five subtests (consisting of 61 items) may be scored separately as the SRC, which was the form of the test used in New Chance.

The BBCS and the SRC have been touted as useful to classify at-risk children (Stebbins & McIntosh, 1996) and as relatively inexpensive proxy measures of intelligence (Howell & Bracken, 1992; Laughlin, 1995). According to Estabrook (1985), the BBCS was originally designed to tap rudimentary vocabulary skills, which would be assumed to correlate well with tests of intelligence. The BBCS was normed on a group of 1,109 children aged 2 years 6 months through 7 years 11 months, which was selected to match closely the 1980 population (according to Census data). However, SES was inferred based on test site, rather than on actual family income (Estabrook, 1985).

Reliability of the BBCS and the SRC has been assessed in a number of ways, and found to be within acceptable limits. Internal consistency reliability using the standardization sample was .97 for the BBCS total score and .90 for the SRC (reported in Polit, 1996). Internal consistency in the New Chance sample was even higher (.98; Polit, 1996). Test retest reliability was assessed in the standardization sample after 14 days and resulted in a .97 coefficient for the total score and .98 for the SRC.

A number of validation studies have been conducted with the BBCS, mostly to test concurrent validity with tests of intelligence. The evidence for associations between the BBCS and intelligence has been mixed. Moderate to very high correlations have been found between the BBCS and the Stanford-Binet 4th edition (Stebbins & McIntosh, 1996). However, low correlations have been found between the BBCS and the Slossen Intelligence Test (Rhyner & Bracken, 1988). The same study also found low correlations between the BBCS and the Preschool Language Scale, a measure of receptive and expressive language. The BBCS had moderately high correlations with the PPVT-R and the Boehm Tests of Basic Concepts (in Estabrook, 1985). The SCR was also investigated for concurrent validity with the Weschler Preschool and Primary Scale of Intelligence (WPPSI; Laughlin, 1995) and found to correlate .77 with the full-scale IQ score. By way of assessing validity in the New Chance sample, scores were correlated with teachers' ratings of class standing. The correlation was significant, although the absolute value was low (.30; Polit, 1996).

The BBCS and the SRC seem to have reasonable reliability and validity as tests of basic concepts. The SRC has been shown to correlate highly with measures of receptive vocabulary and in some cases with tests of intelligence (Howell & Bracken, 1992). Evidence for internal consistency in this sample is encouraging. Its use in this project will be as a measure of mastery of basic concepts necessary for school achievement rather than as a proxy for intelligence.

Behavior Problems Index

The Behavior Problems Index (BPI) was developed mainly from other measures of child behavior problems currently in use, such as the Achenbach Behavior Problems Checklist (Peterson & Zill, 1986; Polit, 1996). The BPI is completed by a parent or other knowledgeable person to rate a given child's behavior (Polit, 1996). In New Chance both mothers and teachers rated children's behavior. The scale has 26 items, or 28 items for school-aged children, each rated on a three-point scale (not true, sometimes true, and always true). It was used in the NLSY and found to have six subscales for that sample: antisocial, anxious/depressed, headstrong, hyperactive, dependent, peer conflict/withdrawn. These subscales were retained in the New Chance scoring protocols.

The BPI, as noted in Polit (1996), was chosen to be a measure of children's socioemotional development in New Chance because of its previous use in NLSY. Scores on the BPI were normed based on scores from the 1981 National Health Interview Survey to have a mean of 100 and standard deviation of 15 (Polit, 1996). Normed scores were computed separately for boys and girls within years of age. For children under age 6, separate norms were computed if the child was in school or not.

Reliability information for the BPI is mixed. Internal consistency reliability of the total BPI score in the NLSY sample was high, ranging from .89 to .90 for preschool and school-aged children respectively (Polit, 1996). In the New Chance sample the range was somewhat lower—.82 - .86 for preschool and school-aged children (Polit, 1996). Internal consistency for the six subscales used in the original New Chance analyses was quite low when mothers were raters (ranging from .49 - .63; Polit, 1996), although teacher ratings were better (ranging from .62 - .85; Polit, 1996). Total BPI scores showed moderately high temporal stability—cross year correlations of BPI total scores (2 years between administrations) were $\underline{r} = .54$ for all children (Mott & Quinlan, 1991).

There has evidently been little work done to explore the various aspects of validity for the BPI. No systematic validity studies have been located in the literature. Validity in the New Chance sample was investigated with correlations between mothers' and teachers' ratings for school-aged New Chance children (Polit, 1996). These were quite low, with $\underline{r} = .30$ for the total BPI score, and subscale correlations ranging from .11 - .36. Because correlations only reflect strength and direction of a relationship, it may have been more appropriate to use a statistic that also took level into account (such as an intraclass correlation). That point aside, the low obtained correlations suggest that validity of the BPI in the New Chance sample should be viewed with caution. Other validity evidence in New Chance was the fact that children who had a tantrum during the interview were rated as having more problematic behavior by both mothers and teachers (Polit, 1996). However, evidence for the significance of these differences was not presented, and the tantrum groups were quite small (ns = 33 and 16 for those with maternal and teacher ratings respectively; Polit, 1996). While there is a dearth of information on the validity and reliability of the BPI, this was the only measure of socioemotional development available for use and appropriate caution will be used when interpreting the results.

APPENDIX B

COMPARISON OF LOGISTIC AND LINEAR REGRESSION MODELS

Supplementary analyses replicating the comprehensive logistic models with linear regression were conducted to ascertain how dichotomizing the outcomes affected modeling. The models were constructed in two ways. First, for each outcome, a model using all potential explanatory variables was fit. Then, linear regression equations using the variables from the most comprehensive of the theoretically-based logistic regression models (Model 5 for each) were calculated. Although direct comparisons between logistic and linear models are not possible, it is possible to compute a phi coefficient (a Pearson r for correlating two dichotomous variables) from a logistic regression contingency table. Since the magnitude of the phi coefficient can be +/-1 only in special cases where the marginal proportions of the two variables are evenly split (Allen & Yen, 1979), taking the ratio of the phi coefficient to its maximum can give an idea of the magnitude of the correlation (Guilford, & Fruchter, 1973). This can then be compared to the R in linear regression since both are Pearson correlations and are based on a common metric.

Results of these linear regression models are presented in Tables B1 through B6. Interpretation of these models requires one to keep in mind that the most favorable BBCS outcomes were higher values, while the opposite was true for behavior ratings. Therefore, positive coefficients indicated association with favorable outcomes for the BBCS and had the opposite meaning for each behavior rating.

Table B1

Continuous BBCS Scores Regressed on All Explanatory Variables

Explanatory Variables	Standardized Estimate (Beta)
Black	0.01
Hispanic	-0.07
Employed prior to New Chance	0.01
Mother's TABE grade equivalent	0.10**
Mother on welfare ≥ 2 years as a child	-0.08**
Highest grade mother completed	0.07*
Male child	-0.05
First born child	0.05*
Child age, Wave II	0.09**
Birth weight in ounces	0.07*
Depressed, random assignment	0.02
Depressed, Wave I	-0.03
Depressed, Wave II	-0.06
High parenting stress, Wave I	-0.01
High parenting stress, Wave II	-0.05
Mother in good health, Wave I	-0.02
Mother in good health, Wave II	0.03
Mother's social support, Wave I	-0.02
Mother's social support, Wave II	0.04
Ever off welfare ≥ 3 months	-0.02
Family below poverty level, Wave II	0.03
Mother lives with children only, Wave II	-0.06*

(Table B1 continued next page)

(Table B1 continued)

Explanatory Variables	Standardized Estimate (Beta)
Positive home environment	0.12***
Child in market (paid) care by Wave I	-0.09
Center-based daycare by Wave I	0.08
Family daycare by Wave I	0.02
Began regular care prior to 1 year	0.07*
Average number of daycare arrangements	-0.00
> 25% time in paid care by Wave I	0.08
≥ 25% time in center-based daycare by Wave I	-0.02
Weeks of education, Wave I	-0.07*
Mother worked at least 352 hours, Wave I	-0.02
Mother employed at least 30% of the time [b]	0.06
Mother earned GED/diploma by Wave I	0.08
Dichotomous BBCS	--
Dichotomous maternal BPI	-0.05
df	35
n	1,229
Adjusted R^2	.11

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table B2

Continuous Maternal BPI Scores Regressed on All Explanatory Variables

Explanatory Variables	Standardized Estimate (Beta)
Black	-0.10*
Hispanic	-0.03
Employed prior to New Chance	-0.01
Mother's TABE grade equivalent	0.03
Mother on welfare ≥ 2 years as a child	0.05
Highest grade mother completed	0.00
Male child	0.05
First born child	-0.04
Child age, Wave II	0.06*
Birth weight in ounces	0.01
Depressed, random assignment	0.02
Depressed, Wave I	0.04
Depressed, Wave II	0.12***
High parenting stress, Wave I	0.08**
High parenting stress, Wave II	0.28***
Mother in good health, Wave I	-0.06*
Mother in good health, Wave II	-0.03
Mother's social support, Wave I	0.01
Mother's social support, Wave II	-0.03
Ever off welfare ≥ 3 months	0.04
Family below poverty level, Wave II	0.00
Mother lives with children only, Wave II	-0.01

(Table B2 continued next page)

(Table B2 continued)

Explanatory Variables	Standardized Estimate (Beta)
Positive home environment	-0.01
Child in market (paid) care by Wave I	-0.05
Center-based daycare by Wave I	0.11*
Family daycare by Wave I	0.04
Began regular care prior to 1 year	0.03
Average number of daycare arrangements	0.00
> 25% time in paid care by Wave I	-0.01
≥ 25% time in center-based daycare by Wave I	0.02
Weeks of education, Wave I	-0.02
Mother worked at least 352 hours, Wave I	-0.01
Mother employed at least 30% of the time [b]	0.04
Mother earned GED/diploma by Wave I	-0.01
Dichotomous BBCS	0.07**
Dichotomous maternal BPI	--
df	35
n	1,229
Adjusted R^2	.19

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table B3

Continuous Teacher BPI Scores Regressed on All Explanatory Variables

Explanatory Variables	Standardized Estimate (Beta)
Black	-0.10
Hispanic	-0.10
Employed prior to New Chance	0.06
Mother's TABE grade equivalent	-0.09*
Mother on welfare ≥ 2 years as a child	0.08
Highest grade mother completed	0.06
Male child	0.19***
First born child	-0.06
Child age, Wave II	0.13**
Birth weight in ounces	0.05
Depressed, random assignment	0.06
Depressed, Wave I	-0.03
Depressed, Wave II	0.03
High parenting stress, Wave I	-0.06
High parenting stress, Wave II	0.15**
Mother in good health, Wave I	0.11*
Mother in good health, Wave II	0.00
Mother's social support, Wave I	-0.02
Mother's social support, Wave II	0.03
Ever off welfare ≥ 3 months	0.07
Family below poverty level, Wave II	0.10*
Mother lives with children only, Wave II	-0.02

(Table B3 continued next page)

(Table B3 continued)

Explanatory Variables	Standardized Estimate (Beta)
Positive home environment	-0.01**
Child in market (paid) care by Wave I	0.05
Center-based daycare by Wave I	0.05
Family daycare by Wave I	-0.02
Began regular care prior to 1 year	0.08
Average number of daycare arrangements	-0.04
> 25% time in paid care by Wave I	0.18*
≥ 25% time in center-based daycare by Wave I	-0.08
Weeks of education, Wave I	-0.14**
Mother worked at least 352 hours, Wave I	-0.03
Mother employed at least 30% of the time [b]	0.05
Mother earned GED/diploma by Wave I	-0.02
Dichotomous BBCS	0.14**
Dichotomous maternal BPI	--
df	35
n	481
Adjusted R^2	.12

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table B4

Continuous BBCS Scores Regressed on Model 5 Variables

Explanatory Variables	Standardized Estimate (Beta)
Black	0.00
Hispanic	-0.08*
Male child	-0.04
Child age, Wave II	0.09**
Mother's TABE grade equivalent	0.10**
Highest grade mother completed	0.06*
Mother on welfare ≥ 2 years as a child	-0.08**
Depressed, Wave II	-0.06*
High parenting stress, Wave II	-0.07**
Family below poverty level, Wave II	0.01
Mother employed at least 30% of the time [b]	0.03
Mother earned GED/diploma by Wave I	0.09**
Weeks of education, Wave I	-0.06*
Favorable home environment	0.13***
Any regular market care by Wave I	-0.05
Began regular care prior to 1 year	0.07*
≥ 25% time in paid care by Wave I	0.09*
df	17
n	1,306
Adjusted R^2	.10

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table B5

Continuous Maternal BPI Scores Regressed on Model 5 Variables

Explanatory Variables	Standardized Estimate (Beta)
Black	-0.12**
Hispanic	-0.05
Male child	0.05*
Child age, Wave II	-0.06*
Mother's TABE grade equivalent	0.00
Highest grade mother completed	-0.01*
Mother on welfare ≥ 2 years as a child	0.05*
Depressed, Wave II	0.15***
High parenting stress, Wave II	0.33***
Family below poverty level, Wave II	-0.00
Mother employed at least 30% of the time [b]	-0.05*
Mother earned GED/diploma by Wave I	-0.01
Weeks of education, Wave I	-0.03
Favorable home environment	-0.01
Any market care by Wave I	0.06
Began regular care prior to 1 year	0.05
≥ 25% time in paid care by Wave I	-0.00
df	17
n	1,306
Adjusted R^2	.18

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table B6

Continuous Teacher BPI Scores Regressed on Model 5 Variables

Explanatory Variables	Standardized Estimate (Beta)
Black	-0.10
Hispanic	-0.09
Male child	0.21***
Child age, Wave II	-0.11**
Mother's TABE grade equivalent	-0.10*
Highest grade mother completed	0.04
Mother on welfare ≥ 2 years as a child	0.07
Depressed, Wave II	0.02
High parenting stress, Wave II	0.13**
Family below poverty level, Wave II	0.09
Mother employed at least 30% of the time [b]	0.07
Mother earned GED/diploma by Wave I	-0.03
Weeks of education, Wave I	-0.13**
Favorable home environment	-0.04
Any market paid care by Wave I	0.06
Began regular care prior to 1 year	0.07
≥ 25% time in paid care by Wave I	0.11
df	17
n	511
Adjusted R^2	.11

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Phi coefficients calculated for each of the three models based on their contingency tables are presented in Table B7. In addition, the maximum attainable phi was also calculated for each and the ratio of the obtained to the maximum computed. These can be compared to the R from the corresponding linear regression models.

Examination of linear models for the BBCS showed that, in addition to the variables that showed strong relationships in the logistic model, there were a few more that reached significance. In addition to each of the terms that was a significant predictor in the logistic model, mothers' welfare history as a child, child age, depression, parenting stress, weeks of maternal education, and beginning childcare before 1 year of age, also were associated with BBCS scores ($p < .05$ in all cases). A comparison of the R from the linear model to the ratio of the phi-coefficient to its maximum (from the logistic model), showed that the R in was somewhat larger.

For the maternally- rated behavior outcome, the linear models also showed parameters that were significant which had not been in the logistic models (i.e., highest grade mother completed, mother's welfare history as a child, male child, child age, and duration of mothers' employment). However, two terms that were significant in the logistic models were not in the linear model: Hispanic ethnicity, and earning a GED or high school diploma. An inspection of R versus the ratio of the phi to its maximum revealed that the logistic model had a higher value. When examining the linear model of teacher-rated behavior scores, the same parameters that were significant in the logistic model were significant in the linear model with the exception on maternal employment.

Table B7

Comparisons of Logistic and Linear Models Using Phi Coefficients

	BBCS	Maternal BPI	Teacher BPI
Φ	.19	.26	.22
Φ_{max}	.85	.47	.51
Φ/Φ_{max}	.22	.55	.43
R	.32	.42	.33

This was significant in the logistic model but not in the linear one. Comparison of the R to the ratio of the phi to its maximum showed that the value of the phi was highest.

For the maternal and teacher BPI scores, the ratio of phi to its maximum resulted in larger values than the corresponding R in the linear models. This supports the notion that the BPI was most useful as a measure of poor behavior. The results for the BBCS indicate that the R from the linear model is of a larger magnitude than the phi, although the difference is not extreme.